AN ABSTRACT OF THE THESIS OF

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Approximately 5,500 years ago a discreet period of wetter and cooler environmental conditions prevailed across the southern Columbia Plateau. This period was marked by the first prominent episodes of erosion to occur along the lower Snake River following the height of the Altithermal and eruption of Mt. Mazama during the mid post-glacial. In addition to the reactivation of small stream courses choked with debris and sediment, large stream channels began downcutting and scouring older terrace faces incorporated with large accumulations of Mazama ash. The resulting degradation of aquatic habitats forced concurrent changes within human economies adapted to the local riverine environments. These adjustments reported for the Tucannon phase time period along the lower Snake River are notable and demonstrate the degree

to which Cascade phase culture was unsuccessful in coping with environmental instability at the end of the Altithermal time period. This successionary event has demonstratively become the most significant post-glacial, qualitative change to occur in the lifeways of lower Snake River people prior to Euro-American influence.

Origin of the Tucannon Phase
in Lower Snake River Prehistory

By

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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DEDICATION

This thesis is respectfully dedicated to the memory of my grandpa, Phillip Tracy Wright, and to the woods that he knew.

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A number of people have contributed in various forms to the completion of this study and deserve recognition.

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Final recognition is left for my wife Tara who, as the spouse of a graduate student, endured every painful step of "The Thesis" and allowed it to consume our first two years of marriage. Her helpful prodding and support through the entirety of this project went beyond expectation. A simple thanks here cannot adequately impart my sincere admiration for her, but must, at least, serve as a start. Thanks, Tara.

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I INTRODUCTION

The Tucannon phase in southern Plateau prehistory is one of six archaeological interpretive units defined by Frank Leonhardy and David Rice (1970) in their attempt at sequentially ordering 10,000 years of archaeological data recovered from the Lower Snake River Region of southeastern Washington. The phase name was borrowed from the Tucannon site, 45CO1 (Nelson 1966), which first produced cultural material assignable to the phase and is the Anglicized Nez Perce place name *toqa'-latoyno*, referring to the confluence of the Tucannon and Snake Rivers (Schwede 1966:39 in Leonhardy and Rice 1970:11).

The areal extent of the Lower Snake River Region as a study area was based upon tactical logic rather than observable cultural boundaries (Kennedy 1976), although a lack of cultural homogeneity during the period's "formative" years did induce Leonhardy and Rice (1970) to further subdivide the region into districts following Donald Lehmer and Warren Caldwell's (1966) use of the term. Leonhardy and Rice's (1970) usage of the phase concept is consistent with that of Gordon Willey and Philip Phillips' (1958) and K.C. Chang's (1967) use of the word denoting an abstract unit of archaeological material comparable to other such units across time and space.

Specifically, they have defined a phase as "a synchronic stylistic macrostructure which articulates a polythetic set of similar components found within a region" (Leonhardy and Rice 1970:2). In keeping with this definition, assemblages comprising the Tucannon phase may be understood to be more alike relative to each other than to assemblages similarly assigned to the preceding Cascade phase, or logically, to assemblages of the following Harder phase.

The Tucannon Phase as an Archaeological Unit

The first detailed conceptual framework to interpret cultural traits within the southern Plateau was produced by Richard Daugherty (1959, 1961). His chronological model utilized five periods of development that grouped segments of local prehistory exhibiting similar cultural traits into singular developmental periods (Fig. 1). Daugherty's periods, as archaeological unit descriptors, are not as refined as Leonhardy and Rice's phases which order information down to the "configuration of archaeological content" (Leonhardy and Rice 1970:22). Thus, because a period is a "larger" or broader chronological unit than the phase, one could logically expect a given period to potentially encompass more than one phase. However, each of Daugherty's (1961) five periods of development temporally coincide with the five

Date (Years B.P.)	Period Name		Phase Name
	Daugherty (1959)	Modified by Leonhardy and Rice (1970)	
150	Historic	Ethnographic	Numipu
250	Snake River		
350 650		Snake River	Piqunin
750 2,000			Harder
3,000 4,250	Developmental Snake River	Initial Snake River	Tucannon
4,750	Transitional		
5,250 7,500		Pioneer	Cascade
8,500 10,000	Lithic		Windust

Fig. 1. Archaeological units of the Lower Snake River Region. Modified from Leonhardy and Rice (1970:23).

phases proposed by Leonhardy (1975) when he revised the cultural sequence for the Lower Snake River Region. The Tucannon phase, then, may be found to correspond to Leonhardy and Rice's (1970) and Leonhardy's (1975) Initial Snake River period as well as with Daugherty's (1961) Developmental Snake River period.

The analogous temporal assignment of the Tucannon phase with the broader Initial Snake River period for the Lower Snake River Region most notably reflects the quality or magnitude of change that occurred during the mid Holocene. To this latter point, Leonhardy and Rice (1970) originally proposed the Tucannon phase to represent a break in the evolutionary continua of the southern Plateau. Based on the distinctive change in artifact forms between the Cascade and Tucannon phases, they questioned whether the two phases were historically related (Leonhardy and Rice 1970:25).

Temporal Placement of the Tucannon Phase

The Tucannon phase, as originally defined by Leonhardy and Rice (1970), spanned a time period from 5,000 B.P. to 2,500 B.P. The phase had a well documented terminal date based on radiometric evidence at six sites. The inception of the phase, however, was poorly dated and relied heavily upon a lower limiting date from component 4 at the Granite Point Locality I (Leonhardy and Rice

1970), which was later reported as inaccurate (Kennedy 1976). Recent work in the Lower Snake River Region has served to refine the date for the phase's inception, but its exact beginning is still not well understood.

At the Alpowa Locality (45AS82) a small, mixed Cascade/Tucannon phase assemblage found on the floor of House 5 had an upper limiting date of 4,060±130 B.P. (WSU-1438) based on stratigraphic association with a charcoal sample (Brauner 1976:152).

Further downstream at the mouth of the Tucannon River, House 3 at Hatiuhpuh (45WT134) yielded dates ranging from 3,940±80 B.P. (Tx6404) to 4,200±70 B.P. (Tx6402) from its floor which contained cultural material assignable to the Tucannon phase (Brauner et al. 1990:79).

The earliest dates for Tucannon phase assemblages within the general Lower Snake River Region come from Hatwai (10NP143) along the lower reaches of the Clearwater River (Ames et al. 1981, Ames et al. 1990). A least two semisubterranean houses at the site appear to predate the earliest house structure known at 45WT134. House 1 was dated to 4,340±90 B.P. (Tx3263) and House 6 returned a date of 5,050±320 B.P. (Tx3933) (Ames et al. 1981:64).

Thus it appears that, in general, the Tucannon phase in Lower Snake River Region prehistory began sometime prior to 5,000 B.P.

Validation of the Tucannon Phase

An effort to define the Tucannon Phase as a valid archaeological unit was attempted by Hal Kennedy (1976), following similar attempts at validating the preceding Cascade and Windust phases by David Rice (1972) and Judith Bense (1972). As a result, and contrary to these previous validation attempts, the Tucannon phase was declared invalid as an archaeological stationary state and its previously assigned assemblages were instead said to represent two separate cultural systems rather than one systemic entity (Kennedy 1976).

The results of the Tucannon phase validity test were based upon three components present in three different sites located within the Lower Snake River Region. The small sample used for the test in addition to later *in situ* recovery and inspection of additional "Tucannon material" has led investigators working in the southern Plateau to implicitly dismiss the findings of Kennedy's (1976) internal consistency test and endorse the use of phase classification for the Tucannon material as originally proposed by Leonhardy and Rice (1970).

The Tucannon Phase as a Normative Construct

An initial attempt at describing the Tucannon Phase was made by Leonhardy and Rice (1970). Based on cultural components from three sites, they characterized the phases's tool kit as one possessing mostly basalt, crudely formed stemmed and side-to-corner-notched projectile points, numerous scraper tools, sinkers and pounding stones. Hopper mortar bases and pestles are also found indicating the exploitation of root crops. Additionally, expedient tools such as utilized cobble spalls and flakes are found along with an assortment of bone tools including a bone shuttle indicative of a net manufacturing industry. Knives do not appear to have been utilized in large numbers. Faunal remains found in Tucannon components include an assortment of ungulates such as deer (*Odocoileus sp.*), elk (*Cervus sp.*), and antelope (*Antilocarpa americana*) in addition to mountain sheep (*Ovis canadensis*) and small mammals. Aquatic resources utilized during the phase include large amounts of river mussel (*Margaritifera falcata*, *Gonidea angulata*) in addition to salmonids (Leonhardy and Rice 1970:11-14).

Leonhardy and Rice's (1970) culture-historical model thus did little to define or explain the cultural systems of Tucannon people, nor was it their intent to do so. Instead, brief discussions based entirely upon the empirical qualities of the phase's tool kit were presented to suggest a cultural trend or an "economical summary" (Leonhardy and Rice 1970:1) of the phase. Their general interpretive model thus reflected ideas commonly shared by lower Snake River people over periods of time, as reflected largely by the morphology of a few types of flaked stone artifacts. The use of this morphological-chronological classificatory scheme was a continuation of other culture-historical models originally developed by W. Gladwin and H.S. Gladwin (1934), and W.C. McKern (1939) in the United States. These normative models relate generalizations or regularities about changes in cultural systems in order to place a given artifact type, and thus culture, in time and space. Such a grouping is performed to bring about an understanding of artifactual associations (Clarke 1972). Often these classifications are determined by statistical averaging techniques where their general or central tendencies are used to relate all encompassing patterns of human behavior or the essence of culture (Young and Bonnichsen 1984). David Young et al. (1989) have described this level of inquiry as macro-analysis.

Ideational variations in culture history serve as the vehicle of classification for normative theorists. If variation in mental templates had not occurred with sufficient magnitude over time, evolutionists would be without the specific events upon which to base their partitive models (Binford 1972).

Cultural chronologies based on morphological similarities between intersite artifact assemblages have been used successfully by archaeologists to document cultural trends. The grouping of morphologically repetitious data is a logical start to interpreting the archaeological record and developing cultural evolutionary sequences. To first understand this broad unrefined mass of data, a process of "focusing" is needed where intuitive avenues and procedures serve to funnel initial data or particles of information into recognizable sets that can be qualified or quantified depending on the nature of the set so defined. This ordering of information from the broad to the specific is the fundamental process of academic inquiry (Bernard 1988). Thus the normative system of artifact grouping and classification can serve as a useful cursory attempt at data organization. Its reliance on trait grouping, metrics and general tendencies is well suited for the initial role of discerning large groups of seemingly non-diagnostic data. Normative analysis provides a starting point not only in terms of organization but in understanding how data sets compare to other data sets developed from similar criteria. Criticisms of the normative approach also serve as its basic utility. The general nature of its classificatory schemes develop expedient typological tendencies in an attempt to order archaeological information in a way that provides a foundation for future work concerned with processual questions (Sabloff and Willey 1967).

Requirement for Processual Investigations

Criticism of normative bound models based on chronological schemes are well documented (cf. Taylor 1948, Binford 1972). Anthony Wallace (1961) has argued normative inquiry negates the diversity within group dictated behavior that in turn is based upon multivariate phenomena. Too, the replication of uniformity used in normative models does not allow for intergenerational change and thus limits investigations of the archaeological record. Instead, processual archaeologists contend that whole cultural-environmental contexts should be used for analysis instead of one single component such as an artifact. Following Boasian concepts, processualists view material culture as mental constructs that reflect culture rather than as culture itself (Trigger 1989). Investigating the "processes of between-unit dynamics" (Binford 1972:196) or the mechanisms of Marshall Sahlins and Elman Service's (1960) *Specific Evolution* should be explored to achieve an understanding of the functional relations within cultures. Models based on the interrelationships of natural and cultural diversity, rather than the replication of material culture uniformity, indeed serve better to answer questions of culture processes (Young and Bonnichsen 1984).

Because the organization of cultural systems are internally differentiated, an observed difference in artifact type does little to indicate the presence or absence of similar adaptive strategies across regional contexts. The normative archaeologist may divide pottery shards on the basis of whether they are stamped, plain or incised whereby the clay medium of pottery indeed reflects the form intended by the artisan, but the role that such vessels play, and why, in the socio-economic systems of its manufacturer's culture cannot be known by simple morphological descriptive statements. Certainly the means of manufacturing Late Woodland pottery can be understood just as the technique involved in levallois lithic reduction is understood, but little knowledge about why these production strategies exist or how their final products relate to the external environment are answered by normative chronologists.

Developing processual investigations such as those by Julian Steward (1970), allow for explication of culture/environmental relationships that normative procedures do not. Analyses of the interrelationships of technology and the natural environment as well as the behavior associated with that technology and its role within a given culture, are needed to bring about an understanding of culture-process (Haviland 1987). Adding to, and following Walter Taylor's (1948) original *Conjunctive Approach*, efforts aimed at exploring functional processes with a systems view of culture along with "total comparisons of available materials, functional analysis of cultural features, and, most importantly, explicit statements regarding hypothesis formulation and testing" (Rice 1972:4) are imperative for those restructuring southern Plateau prehistory. Reconstructing prehistoric lifeways thus requires explanations of how and why activities changed at sites over time (Schalk and Cleveland 1983) by comparing their external contexts with functional changes observed in the archaeological record.

Statement and Approach to the Problem

The material culture of the Lower Snake River Region, and the evolutionary models existing to format such data, have provided southern Plateau researchers with a wealth of information concerning the historical development of the Region's riverine cultures. Very little work, however, has centered upon explaining the mechanisms involved that ultimately structured these cultures across time and space (cf. Brauner 1975, 1976, Schalk 1977, Ames and Marshall 1981, Lohse and Sammons-Lohse 1986). The purpose of this study, then, is to explore why the transition between the Cascade and Tucannon phases occurred. Assumptions concerning culture change and conservatism will follow those presented by Leslie White (1949) and Sahlins and Service (1960).

Focussing on the stresses present within the cultural systems of lower Snake River folk as well as the functional changes apparent in the archaeological record at the time of this cultural transition should illuminate culture-change processes. Although Daugherty (1961) and Leonhardy and Rice (1970) did not assume a cause for this abrupt transition, they did recognize it as a critical evolutionary departure demanding of not only phase distinction, but also status as a new period of cultural evolutionary development within the Lower Snake River Region. This successionary event has demonstratively become the most significant post-glacial, qualitative change to occur in the lifeways of lower Snake River people prior to Euro-American influence.

II TUCANNON PHASE HISTORICAL BACKGROUND

General Summary of Tucannon Phase Sites

At the time of its conception in 1970, the Tucannon phase was configured around assemblages recovered from 45CO1, the Tucannon Site (Nelson 1966); 45FR50, Marmes Rockshelter (Rice 1969); and 45WT41, Granite Point Locality I (Leonhardy 1970). The initial lack of Tucannon phase sites within the Lower Snake River Region hindered efforts to adequately define the phases's temporal and cultural associations. It was not until the middle 1970's that additional Tucannon material was found in sites in and adjacent to the Lower Snake River Region, that qualitative refinements could be made to the phase.

In 1975, David Brauner reported Tucannon material from 45AS41, the Scorpion Knoll site, near Buffalo Eddy on the Snake River approximately eighteen miles upstream from Clarkston, Washington. Brauner (1976) and Martha Yent (1976) followed one year later with reports of additional Tucannon material at 45AS82 and 45AS78, the Alpowa Locality; and 45WT39B at Wawawai. Both locales are located within the Lower Granite Reservoir. Following the work completed at Wawawai, Kennedy (1976) reported on and used the Tucannon phase material from that site as well as assemblages from 45CO1 and 45WT41 in his evaluation of the Tucannon phase.

The results of these projects effectively concluded initial salvage operations undertaken within the Lower Snake River Region as far as Tucannon phase site reporting was concerned. Archaeological projects conducted within the Region prior to this had been driven by activities associated with constructing hydroelectric dams, and ceased with the completion of Lower Granite Dam and the impoundment of water behind it in February of 1975 (Brauner et al. 1975). Another six years was to pass until additional Tucannon phase material was reported from this area of the southern Columbia Plateau.

In 1981, Ames et al. produced an interim report on the results of their highway salvage work at 10NP143, the Hatwai site, located four miles east of Lewiston, Idaho on the Clearwater River. Finally, in 1989 Chance et al. and later Brauner et al. (1990) produced the latest reports to include Tucannon material within the Lower Snake River Region. Their reports on archaeological data recovery at 45WT134, the Hatiuhpuh site, concludes the list of eight Tucannon phase sites available for study within the general Lower Snake River Region at this time.

Tucannon Phase Assemblages

The following is a brief summary of sites and assemblages assignable to the Tucannon phase that have been reported from the eight sites in and adjacent to the Lower Snake River Region (Fig.2).

Tucannon Site (45CO1; Nelson 1966)

The Tucannon Site was excavated by Charles Nelson and David Rice in 1965. The site is located at the mouth of the Tucannon River and was the first site within the Lower Snake River Region to produce cultural material that was later used to define the Tucannon Phase. Assemblage 3 from the site is well defined and is one of the larger Tucannon phase assemblages discovered to date. Nelson (1966) assigned the temporal range of the assemblage from 1,950 B.P. to 4,000 B.P. Although no structural features were noted by Nelson (1966) at the site, Nelson (1965:21) and Brauner et al. (1990:149) feel that semisubterranean houses may have been present, but went unrecognized during the course of excavation.

Marmes Rockshelter (45FR50; Rice 1969)

The Marmes Rockshelter site is located along the Palouse River, approximately 1.5 miles upstream from its confluence with the Snake River. The site was extensively excavated by Washington State University between 1962-1968. A small assemblage of Tucannon phase artifacts were found within the site. Judging from projectile point

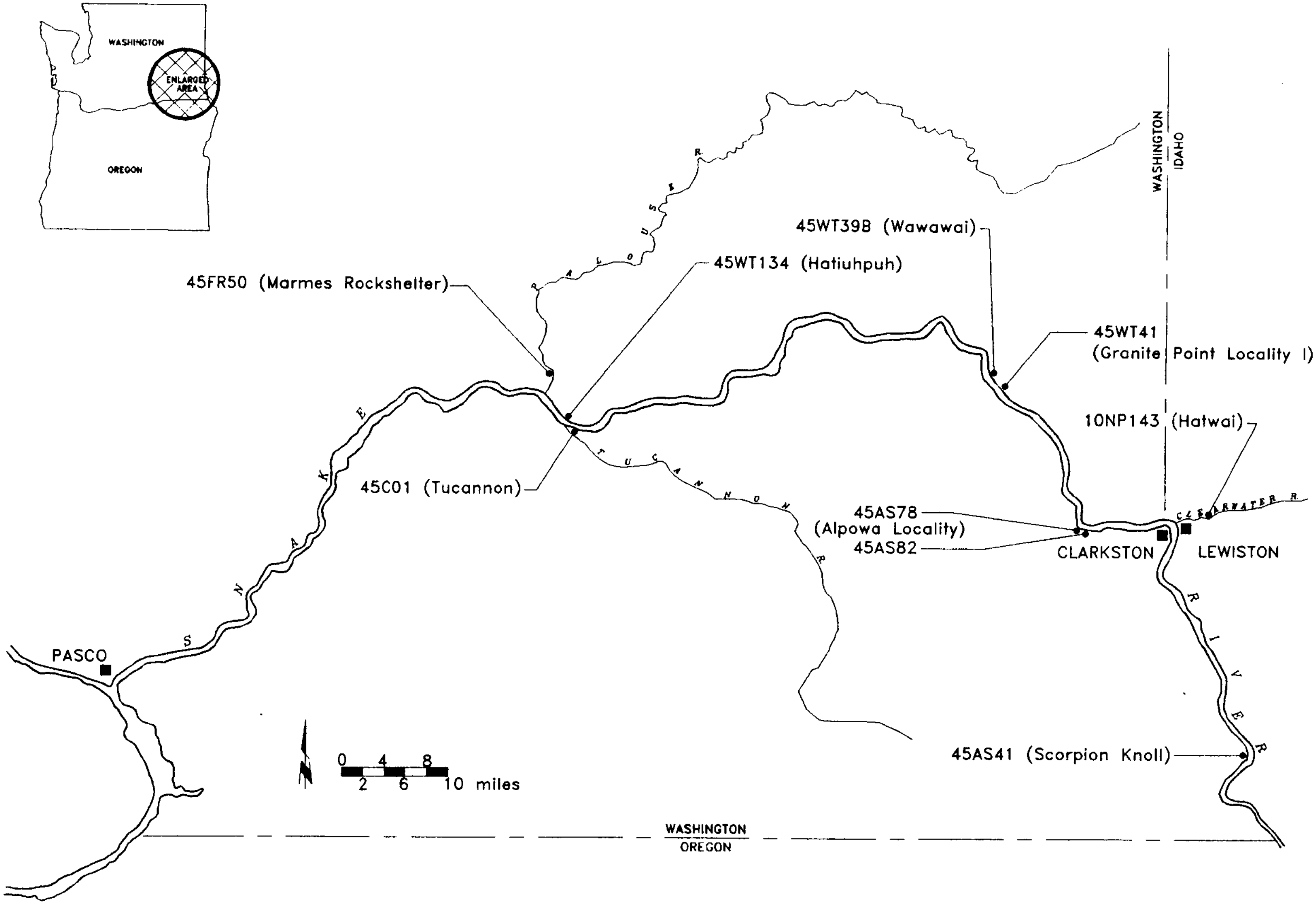

Fig. 2. Tucannon Phase Sites

morphology, Tucannon phase material lies within stratigraphic units five and six. Unfortunately no reliable mid post-glacial dates are available from the site to aid in understanding when Tucannon people occupied the site, nor has the site been adequately reported to date.

Granite Point Locality I (45WT41; Leonhardy 1970)

Granite Point Locality I contained a small component of 248 artifacts that were later used in defining the Tucannon phase. The site was excavated between 1967 and 1968 by Washington State University field schools. Frank Leonhardy directed field operations in the final year of work at the site and used, in part, his experiences and data from the site to assist in developing the cultural sequence for the Lower Snake River Region. The 5,000 B.P. date originally proposed for the inception of the Tucannon phase by Leonhardy and Rice (1970) was based upon a lower limiting shell date obtained from component 4 of the site which contained material of Tucannon form. The shell date is now considered to be inaccurate (Kennedy 1976:13).

Scorpion Knoll (45AS41; Brauner 1975)

The site was excavated in 1973 by Washington State University and recovered 172 artifacts including a small

Tucannon phase assemblage. An Asotin County road construction project had threatened the site and efforts were made to salvage what remained after previous road construction activity had removed much of the site. Although located outside of the Lower Snake River Region, the site is considered relevant for two reasons. The original boundary of the Lower Snake River Region was based upon "an arbitrarily defined unit reflecting neither the ethnographic nor prehistoric culture boundaries" (Kennedy 1976:3). Additionally, Tucannon phase material from the site show close affinities to 45CO1 and 45WT41, both of which are located within the Lower Snake River Region as defined by Daugherty (1959, 1961) and Leonhardy and Rice (1970).

Wawawai (45WT39B; Yent 1976, Kennedy 1976)

45WT39B is located 1/2 mile south of Wawawai, Washington on the east bank of the Snake River. The open site was excavated by Frank Leonhardy in 1971 and contained three assemblages assignable to the Tucannon Phase. Although the prehistoric elements of the site were reported by Yent, she elected not to report on the Tucannon phase component which was designated assemblage five-component III. Instead, Hal Kennedy reported on this portion of the site in his Master's thesis in 1976. The Tucannon component of the site is small and composed of one combined assemblage containing one feature consisting of a charcoal stained pit overlaid by two sectioned antlers.

Kennedy Overview (1976)

An attempt to test the validity of the Tucannon phase as an archaeological unit was made by Hal Kennedy in 1976. He compared the internal similarities of six Tucannon phase assemblages from 45CO1, 45WT41 and 45WT39B. The same descriptive classifications previously used in testing the Windust (Rice 1972) and Cascade (Bense 1972) phases was used by Kennedy. Additionally, he employed utilization classifications to guard against biases inherent in the original descriptive classifications employed by Leonhardy (1970), and later used by Rice (1972) and Bense (1972). Kennedy's (1976) comparative classifications showed dissimilarity between intra-phase assemblages and led him to propose that the Tucannon phase was not a valid archaeological unit. Archaeological investigations conducted within the Lower Snake River Region have since shown a certain cultural homogeneity not reflected in Kennedy's results. Kennedy ruled out the possibility that his study used too small a sample by stating:

> The question of adequate sampling does not arise within this study. The study begins with the assumption that the material being analyzed is an adequate sample of the Tucannon phase time period. To do otherwise would stagnate this analysis into providing just what has been recovered and not what those recovered data may mean (Kennedy 1976:11).

Alpowa Locality (45AS82 and 45AS78; Brauner 1976)

The Alpowa Locality is situated on the left bank of the Snake River, eight miles downstream from Clarkston, Washington. A series of archaeological investigations conducted by Washington State University between 1972-1974 uncovered 6,000 years of prehistory. Sites 45AS82 and 45AS78 together provided a large Tucannon phase component for the Locality, of which three of the Locality's four Tucannon phase assemblages were associated with the remnants of three semisubterranean houses. House 5 at 45AS82 was the earliest and dated to 4,060 B.P. Occupation of 45AS82 by Tucannon people resulted in an extensive smear of cultural debris over a wide area.

With the exception of work performed at 45GA61 (Leonhardy et al. 1971), excavation techniques at the Alpowa Locality were a departure from previous work conducted within the Lower Snake River Region. Large horizontal units were excavated in an attempt to elucidate spatial relationships within single components. The effort was largely successful and documented many theretofore unrecognized intra-site associations for the Tucannon phase time period.

Hatwai (10NP143; Ames et al. 1981, Ames et al. 1990)

The Hatwai site is located approximately four miles east of Lewiston, Idaho on the north bank of the Clearwater River at the mouth of Hatwai Creek. The site was excavated by Boise State University in 1977 and 1978 as a result of a State of Idaho highway construction project. Although outside of the Lower Snake River Region, the site is included here for study for the same reasons that 45AS41 has been included. Cultural similarity with sites of the Alpowa Locality are unmistakable. An extremely large Tucannon component (Hatwai III) was found in association with ten semisubterranean houses dating from 5,050 B.P. to 3,100 B.P. Excavation strategy at the site was formed around the need to strengthen culture-historical relationships within the Clearwater River Basin as well as to gather site structure data needed in answering processual questions. As a result, not only were trenches employed to recover deep stratigraphic profiles, but large blocks were also excavated in hopes of recovering intra-site spatial relationships. Hatwai produced the earliest semisubterranean house structures within the greater Lower Snake River Region and should contribute significantly to our understanding of the Tucannon phase time period when the final report is available for review.

Hatiuhpuh (45WT134; Chance et al. 1989, Brauner et al. 1990)

45WT134 is located opposite the mouth of the Tucannon River, high atop the right bank of the Snake River. The Walla Walla District, Army Corps of Engineers sponsored a testing program of the site after its location was brought to their attention in 1980. Archaeological testing of the site by Glen Hartmann in 1984 revealed living surfaces strewn with a small collection of artifacts morphologically similar to previously recovered Tucannon phase material. As a result, a two year data recovery program began in 1987. David Chance of the University of Idaho directed field operations during the first field season. Four semisubterranean houses were present at the site and House 2 was determined coincident with the Tucannon Phase based on radiocarbon dates from its floor ranging from 3,640 B.P. to 3,980 B.P. (Chance et al. 1989, Brauner et al. 1990:52). Data recovery at the site continued in 1988 by archaeologists from Oregon State University, led by David Brauner. House 3 was excavated and found to be as much as two meters deep with a possible entry tunnel on its northeast side. Four hundred and sixty-eight tools or tool fragments were recovered from the floor of House 3. A small portion of these tools were projectile points that conform to types assignable to the Tucannon Phase. Three radiocarbon dates obtained from charcoal on the floor of House 3 ranged from 3,940 B.P. to 4,200 B.P. and thus substantiate the stylistical placement of the floor's artifact assemblage with the Tucannon phase.

III CULTURAL REVIEW OF THE TUCANNON PHASE

To date, no detailed synopsis has been offered that characterizes the content of the Tucannon phase culture beyond the cursory descriptions offered by Leonhardy and Rice (1970) and Kennedy's (1976) validation test. It is generally difficult to propose explanatory statements concerning culture change without statements concerning its final product. If product implies process then the articles of Tucannon culture should reflect the processes of culture change occurring at the time of the Cascade/Tucannon phase transition. It is also equally difficult to understand the end product of culture change without an understanding of the product's initial form.

The following is a discussion of Tucannon phase cultural tendencies represented by the actions of group behavior throughout the phase as well as by individuals at point-in-time settings. The partitive summary is meant to provide a small portrait of Tucannon phase life rather than an exhaustive list of mundane cultural attributes. This summary concludes with a comparative discussion concerning cultural dissimilarities between the Tucannon phase and the preceding Cascade phase.

Settlement Patterns

Madge Schwede (1966, 1970) has documented ethnographic Nez Perce settlement patterns and their relationship to surrounding environmental variables. She concluded that village sites are generally concentrated at the confluences of large and middle-sized streams, whereas camp sites are more often associated with confluences of large and small-sized streams (Schwede 1970:131). Tucannon phase site locations tend to adhere to this model with several exceptions. Although sites 45CO1 and 45WT134 are located at the confluence of the Tucannon and Snake Rivers, their separate locations may signify selective criteria noted by Brauner et al. (1990:146). Further discussion of these two sites' locations will be returned to in the final chapter.

The Alpowa Locality and sites 10NP143 and 45AS41 are all located at the mouth of small streams. Sites 45AS78 and 45AS82, comprising the Tucannon phase sites at Alpowa, are near the mouth of Alpowa Creek on Silcott Bar situated on the south bank of the Snake River. Site 45AS78 is situated on an alluvial fan at the mouth of a small canyon possessing its own seasonal stream. Site 45AS82 is located just to the west of where the mouth of Alpowa Creek was thought to have been located during the Tucannon phase time period (David Brauner, personal communication 1994). Site 10NP143 is located at the mouth of Hatwai

Creek situated on the downstream end of a large alluvial bar along the north bank of the Clearwater River. Site 45AS41 was found on the third terrace above the current level of the Snake River, located opposite the mouth of Captain John's Creek on the west bank of the Snake River. Additionally, site 45WT39B is located on Wawawai Bar one-half mile downstream from the mouth of Wawawai Creek.

Sites 45WT41 and 45FR50 are not located at the confluence of any streams, large or small. The rock shelter associated with 45FR50 along the Palouse River would have attracted people to its location for obvious reasons. Site 45WT41 is located on the downstream end of Granite Point Bar within the Snake River canyon, approximately two miles upstream from Wawawai Canyon.

Tucannon folk generally located themselves along the lower Snake River much as the ethnographic Nez Perce did. Site locations were generally formed around the locations of large and small stream confluences as well as natural shelters such as at 45FR50.

A handful of Tucannon phase sites also tended to be located at the downstream end of gravel bars. Although sites such as 45WT41, 45WT39B, 45AS80 and 10NP143 are all located at such locations, it is not uncommon for gravel bars within the lower Snake River to be truncated by side drainages which may have served as the actual attractor to the site's location rather than the geomorphic presence of an abridged bar. An expanded discussion of Tucannon phase settlement patterns will be returned to in the final chapter.

House Design

Semisubterranean houses have been documented within Tucannon phase sites at 45AS82, 10NP143 and 45WT134. Speculation has occurred concerning the possible presence of house features at 45CO1 (Nelson 1965:21; Brauner et al. 1990:149). If house depressions were indeed present at the 45CO1 they were not recognized during the course of excavation. A possible Tucannon phase semisubterranean house feature has also been proposed for 45WT41. Kennedy (1976:26) notes that a semi-circular arrangement of rock associated with a 25 cm deep depression noted in a stratigraphic profile at the site, may have been associated with a house-pit feature at 45WT41.

Although Tucannon phase sites with house features are not numerous within the Lower Snake River Region, they have been reported in numbers that allow a cursory statement concerning their form and function.

45AS82

Houses 3, 4A and 5 provide limited structural detail of Tucannon phase houses at the Alpowa Locality. House 5 contained a mixed Cascade/Tucannon phase tool assemblage and is considered here an early Tucannon phase house with an upper limiting date of 4,060 B.P. (Brauner 1976:152). House 5 was 40 cm deep, ten meters in diameter and circular in plan view without an annular bench. Brauner (1976:179) believes that the house had an entryway on its southeast side based on the location of external activity areas.

House 4A was largely destroyed by the construction of the overlying House 4. Its pit was 60 cm deep and had one remaining wall sloping at approximately 55 degrees. No information concerning its shape or size remain other than a subangular bend in the south wall which may reflect a shape other than circular. No annular bench was noted for the house. House 4A had an upper limiting date of 1,940 B.P. and a Tucannon phase tool assemblage which Brauner (1976:145) believed dated between 4,000 B.P. to 2,000 B.P.

Only a remnant of House 3 was recovered at 45AS82. A majority of the house had been destroyed by flooding and little structural detail remained of the house. Based on what remained of the rim, the house may have been circular or subangular in plan view. The house had an upper limiting date of 2,500 B.P. (Brauner 1976:117).

10NP143

Ten semisubterranean houses were excavated at Hatwai and ranged in age from 5,050 B.P. to 3,100 B.P. Ames et al. (1981:118-121) have divided the ten houses between two styles depending on their structural form (Fig. 3). House 1 and House 3 defined Style 1 and are characterized as subsquare in plan view, 70 cm deep with both possessing an annular bench two meters wide around the periphery of the pit which is four meters square. An entry ramp angled at 10 degrees is believed to have accessed House 1 on its south side. House 1 also had its pit walls excavated at 80 degrees.

Houses 2 and 4 through 10 comprise Style 2 and are subrectangular to circular in design and measure seven to eight meters in diameter. The pits are 70 cm to one meter in depth and possess walls angled at approximately 45 degrees. No annular benches are noted for Style 2 houses. Houses included in Style 2 span the entire time period from 5,050 B.P. to 3,100 B.P., while dates for the houses of Style 1 range between 4,300 B.P. to 3,400 B.P. Ames et al. (1981:121) caution that too few houses may be represented by Style 1 to justify an importance of a type/period designation.

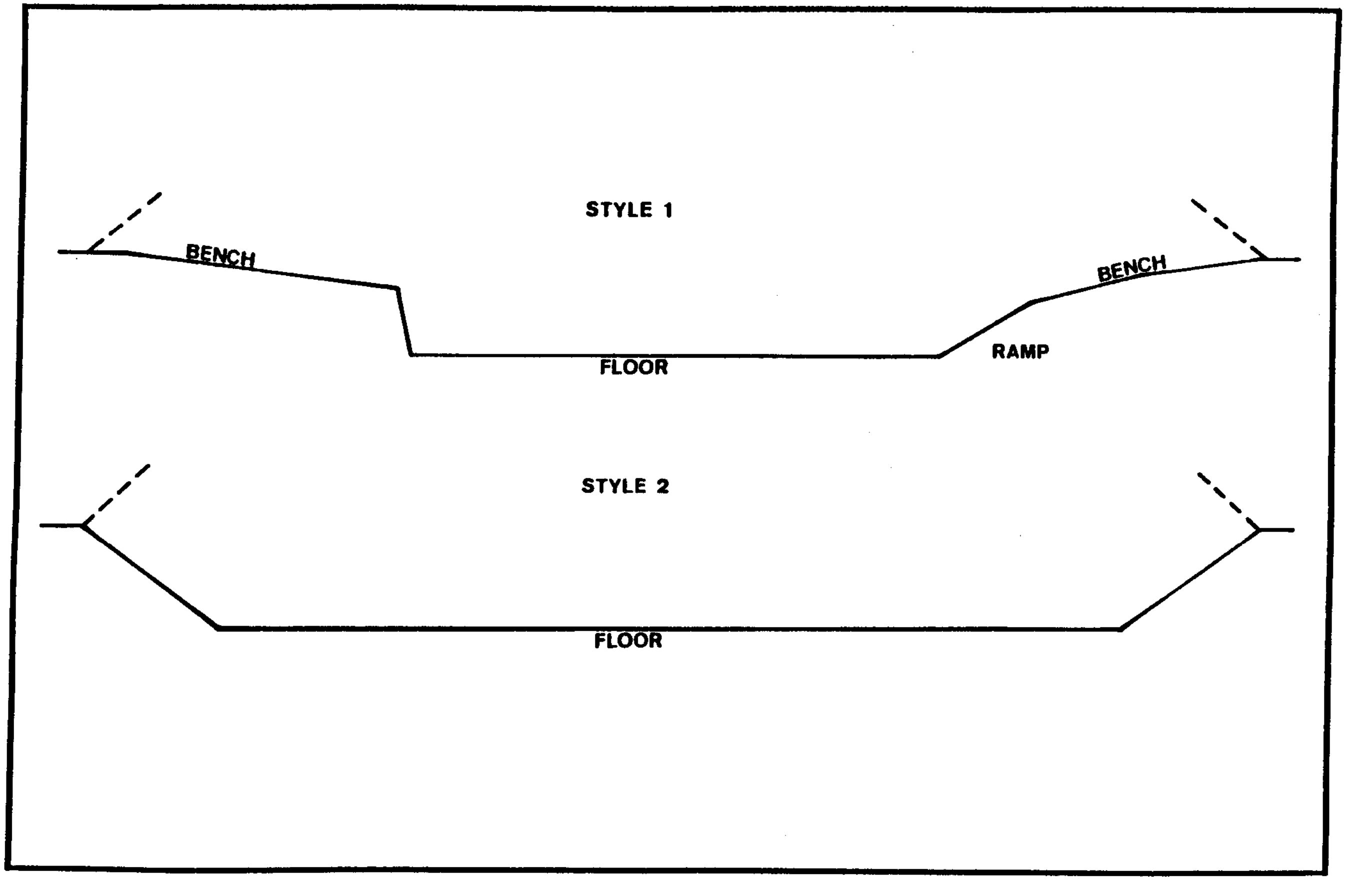

Fig. 3. Semisubterranean house styles at 10NP143. Style 1: 4,300 B.P. to 3,400 B.P. Style 2: 5,050 B.P. to 3,100 B.P. From Ames et al. (1981:120).

45WT134

Houses 2 and 3 from Hatiuhpuh have been assigned to the Tucannon phase. Little information exists concerning the form of House 2 other than it was oval in plan view. House 2 dated from 3,640 B.P. to 3,980 B.P. (Chance et al. 1989; Brauner et al. 1990:52).

House 3 was circular in design and seven meters wide. Because it was excavated into a steep slope the depth of the resulting pit varied between 1.5 to 2 meters deep. Its walls were excavated at 50 to 55 degrees. A low angle roof is assumed for the structure and a tunnel entry on its northeast margin has been proposed by Brauner et al. (1990:76). The tunnel feature is two meters wide and over three meters long (Fig 4). House 3 dated from 3,940 B.P. to 4,200 B.P. (Brauner et al. 1990:53).

No strict rules of construction are apparent for Tucannon phase houses. Instead, general ideas held by Tucannon folk on how semisubterranean houses should be constructed were adjusted to meet the demands of the local site and environmental setting. Generally the houses were circular to subangular in plan view and varied from four to ten meters in diameter. Slopes of pit walls were largely determined by the stability of local sediments. The houses were generally 40 cm to 70 cm deep with House 3 at Hatiuhpuh being over 1.5 meters deep. Annular benches for Tucannon phase houses have only been found in

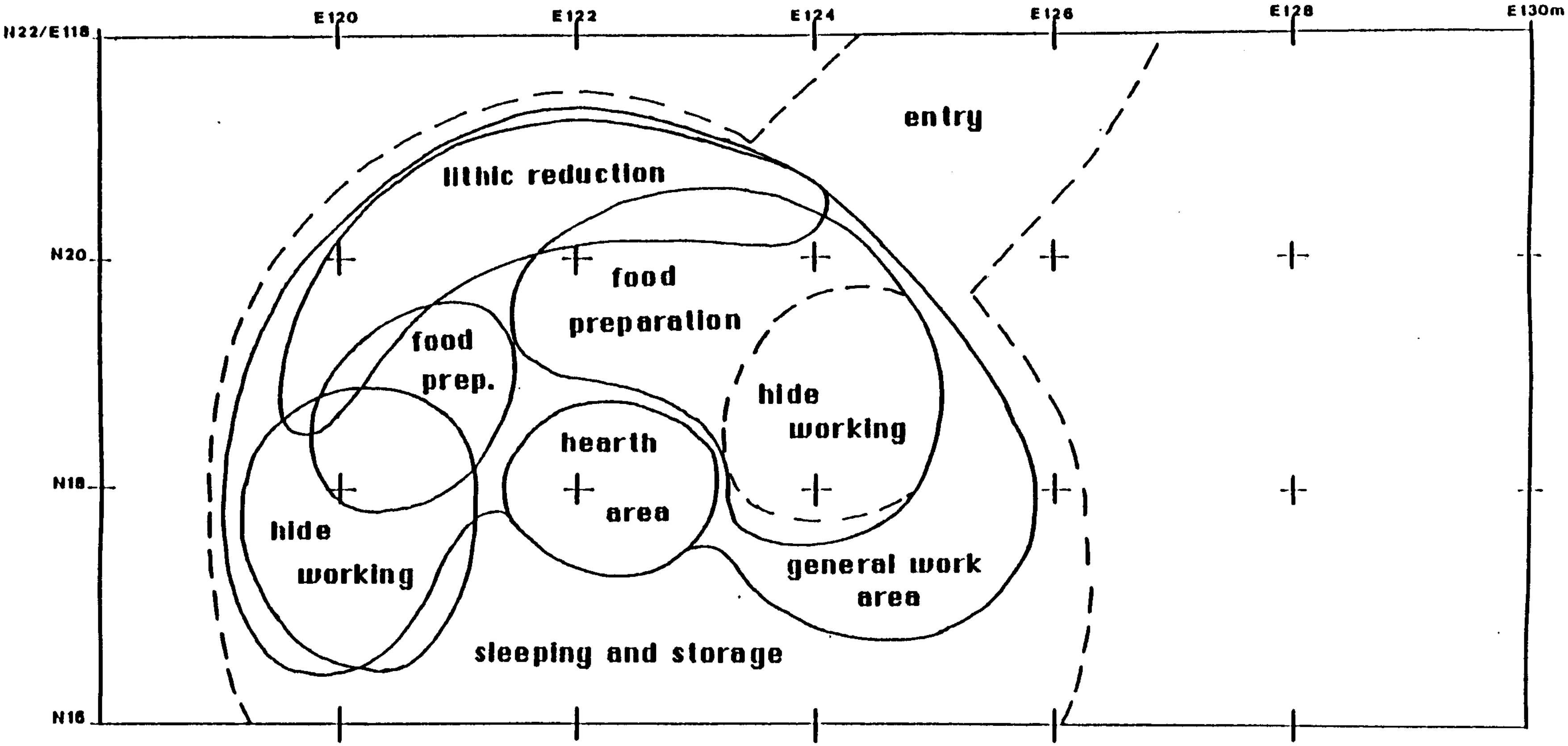

Fig. 4. Proposed entry tunnel and internal activity areas for House 3 at 45WT134. From Brauner et al. (1990:84).

the Style 1 houses at Hatwai. Entry features are few and consist of the tunnel entry on the northeast side of House 3 at Hatiuhpuh and a presumed ramp on the south side of House 1 at Hatwai. A possible entry way has also been proposed for the southeast side of House 5 at Alpowa. No evidence of house superstructures have been reported.

Open Surface Features

Surface features related to the external work areas of Tucannon phase semisubterranean houses will be reviewed later. This section will comment on only those open surface features which were not found associated with known house structures.

45WT41

Forty-four Tucannon phase occupational features were encountered at the Granite Point Locality I and included within component 4 of the site (Kennedy 1976). The majority of features consisted of surfaces strewn with heavy amounts of fire-cracked rock, bone fragments, shell lenses and associated artifacts. Additionally, Feature 31 consisted of a cluster of 16 small, flat river pebbles and Feature 8 was comprised of a large flat rock and associated small stones in addition to bone fragments (Kennedy 1976:25-29).

45WT39B

Tucannon phase features associated with the main occupation at Wawawai have not been separated and identified with the exception of a clustering of fire-cracked rock located along the lower bench area of the site and two sectioned antlers overlying a charcoal stained pit (Kennedy 1976:32).

Alpowa Locality

45AS78 and 45AS82 both possessed open surface features assignable to the Tucannon phase. Features 5 and 6 at 45AS78 are characterized by an abundance of scraping tools. A small amount of piercing, cutting and crushing tools were recovered as well. An extremely large amount of fire-cracked rock as well as mussel shell were found within both features (Brauner 1976:267,302).

An extensive Tucannon phase open surface feature was encountered at 45AS82 that extended across 7,200 sq. meters of the site. Brauner (1976:301) believes that this feature is probably the external work areas for Tucannon phase houses destroyed by subsequent house construction episodes, or associated with Tucannon phase houses not sampled during excavation. No recognizable activity areas were present within the feature except for an equipment repair and lithic reduction station characterized by preforms, core fragments, projectile point basal sections and an antler tine (Brauner 1976:192).

10NP143

No definite activity areas within open surface features were discerned at Hatwai, however poorly represented "yard features" may have been present at the site (Ames et al. 1981:123). Unoccupied house depressions adjacent to Houses 1, 2 and 3 may have been used as external work areas by Tucannon folk. Specifically these areas are characterized by the presence of hopper mortar bases, or anvil slabs, surrounded by debris consisting of cobbles, fire-cracked rock, crushed shell, macerated bone, debitage and an assortment of tools.

House Activity Areas

Both internal and external activity areas of semisubterranean dwellings have been documented at 45AS82 (Brauner 1976) and 45WT134 (Brauner et al. 1990).

45AS82

House 5 at 45AS82 is believed to have had an entry way located on its southeast margin. Immediately inside the house at the entryway location, a food preparation area was proposed by Brauner (1976) based on the presence of hopper mortar bases, anvils, and pounding, crushing, and cutting tools (Fig. 5).

A small amount of debitage was found in the south-central portion of the house and appeared to be a lithic manufacturing station dominated by tool repair and sharpening activities. Large amounts of primary lithic debris, blanks or cores were not present within House 5, indicating that the initial steps of lithic reduction were probably conducted elsewhere.

A hide preparation workshop is proposed for the northern portion of the house based on the presence of scrapers, and cobbles which are believed to have functioned as a backing surface or small platforms for the hides. The western portion of the house is believed to have been used for sleeping and storage based on the absence of task specific tools located there.

Women's activities are dominant within the house whereas men's activities are nearly absent. Duel artifact types within the food preparation area may indicate the presence of two economically viable females within the house. No such duplicity for male dominated tasks was noted.

The exterior activities of House 5 generally compliment rather than duplicate activities discerned from within the house. A hide and meat processing station characterized by choppers, knives and utilized flakes was

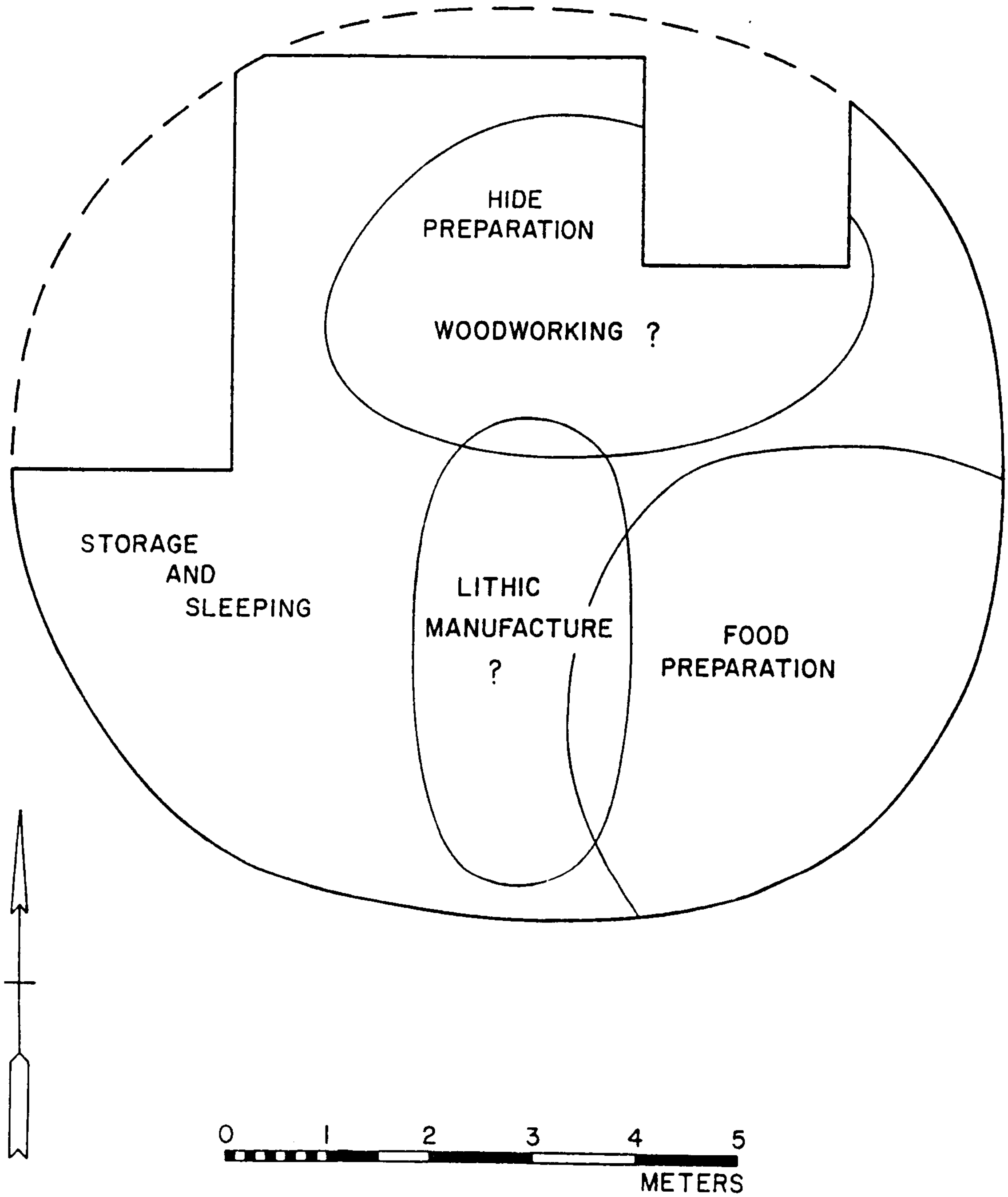

Fig. 5. Proposed internal activity areas for House 5 at 45AS82. From Brauner (1976:162).

located outside of the proposed entryway and probably served as a station where initial meat processing activities occurred.

A general work area adjacent to the hide and meat processing area was proposed based on the broad range of tools present.

A lithic reduction workshop northeast of House 5 contained Levallois-like core fragments, primary blanks and hammerstones (Brauner 1976).

House 4A at 45AS82 was largely destroyed by the construction of House 4. The southern portion of the house is believed to have been a food preparation area based on the presence of a hopper mortar base and pestles (Fig. 6). Hide working and a possible basket manufacturing station may be represented to the east of the food preparation area based on the presence of scrapers, edge-polished cobble spalls and four bone awls (Brauner 1976). Male related tasks are not represented within the fragment of House 4A.

House 3 at 45AS82 had been eroded and produced too little information to be included here.

45WT134

House 3 at 45WT134 appears to have had a hearth feature present within the middle of the floor and was directly surrounded by several food processing and hide

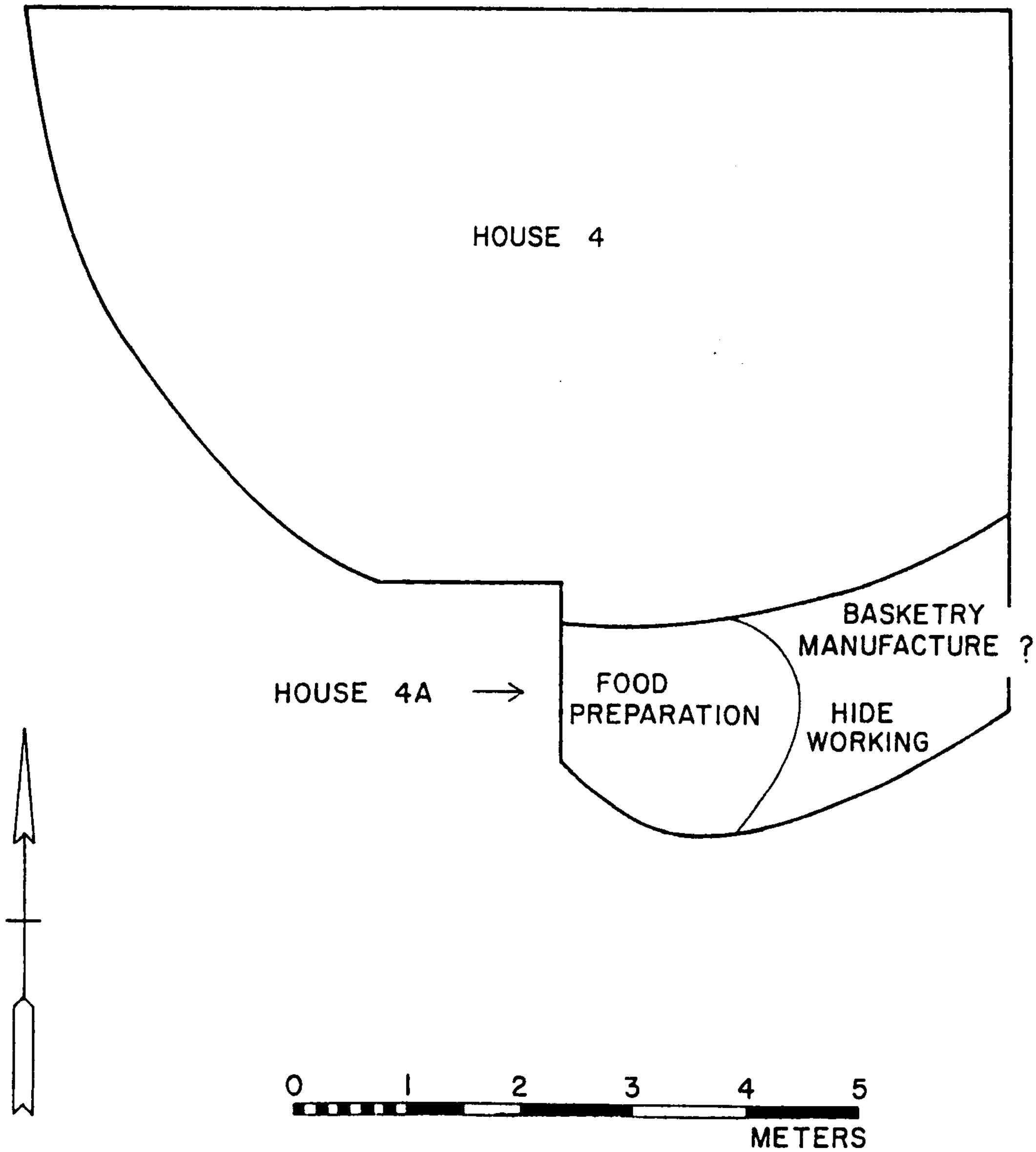

Fig. 6. Proposed internal activity areas for House 4A at 45AS82. From Brauner (1976:151).

working activity areas. These areas were characterized by hopper mortar bases, anvil stones, chopping tools, edge battered cobbles and fragmented bone (Brauner et al. 1990).

Hide working activity areas are represented at the western and eastern margins of the house floor area and are characterized by profuse amounts of edge polished spall scrapers, along with drills, gravers, bone awls and edge polished cobbles. Both initial and final stages of scraping are indicated.

Lithic reduction did occur along the northern margins of the house, but was not a dominant activity.

The extreme southern portion of the house is thought to have been used for sleeping and storage given the lack of artifactual material in that area.

The duplicity of activity areas within House 3 may reflect two families present or two economically viable females within the same household (Fig. 4).

Activity areas outside of House 3 are indicative of two different activity loci pertaining to the occupation of the house. Artifacts from the northern and southern activity areas were fairly similar and produced numerous amounts of large blocky anvil stones and edge polished scrapers. Also present in each area were edge battered cobbles and hammerstones that seem to be related to the presence of anvil stones in the southern work area.

Chopping tools, although not as frequent as edge battered cobbles, seem to be found with the cobbles in both activity areas. Hide preparation was a major activity performed in both external activity areas followed by food production and lithic reduction. Lithic reduction was not a dominant activity and was represented mostly by cores and blanks in the northern activity area. The lithic debris was indicative of primary reduction, consisting of crude blanks discarded after breaking (Brauner et al. 1990).

10NP143

Although Tucannon phase house features at 10NP143 were excavated in a manner conducive to discerning internal activity areas, no such loci were found (Ken Ames, personal communication 1994). However, spatial analysis did show a relationship between mortar/pestles and cobble tools, as well as a clear patterning to internal house furniture. Also, the location of large basalt slabs appeared to control the location of activity associated with them. There may have been a pairing of these slabs with mortar bases, indicating multiple steps in the processing sequence or two like processing stations in operation at the same time (Ames et al. 1990).

Based upon three Tucannon phase semisubterranean houses from 45AS82 and 45WT134 a logical spatial patterning of household activities may be apparent. Entries to the houses were logically placed on the leeward side of the structure out of the wind. Food preparation areas were located just inside house entryways. Brauner (1976:239) has proposed the location of food preparation areas within Harder phase houses at the Alpowa Locality using inferred sources of light available within those houses. Light coming through the entryway and smoke hole as well as light emanating from the hearth were thought to have dictated the location of internal food preparation areas. Hide working areas of Tucannon phase houses were seemingly placed along the outer margins of the floor away from food processing areas. Sleeping and storage areas appear to have been placed opposite the side of the house where entryways were located. What little evidence exists for lithic manufacturing within the houses appear to indicate that if the activity occurred at all, it was relegated to the outer margins of the floor, well away from the more dominant activities of food processing and hide preparation. Brauner's (1976:165) statement that household activities reflected within houses are more akin to female related tasks is further strengthened by evidence from 45WT134.

Domestic activities external to the houses seem to largely reflect activities not well represented within the houses. Primary lithic reduction was almost exclusively performed outside of the houses. General work areas and hide and meat processing stations are also indicated. These areas are located adjacent to entryways and probably reflect a logical positioning out of the wind while maintaining continuity with concurrent interior tasks.

Tool Kit

Three types of projectile point forms are common within Tucannon phase assemblages. Crudely formed stemmed and side-to-corner-notched points (Leonhardy and Rice 1970:11) are common and typify many assemblages, while a low side-notched or corner removed point with "ears" dominate assemblages at the Alpowa Locality and at Hatwai (Fig. 7). An expanded discussion concerning projectile point forms associated with Tucannon phase tool assemblages will be returned to in the final chapter.

Numerous scraper tools, hopper mortar bases, pestle-like implements, anvil stones, edge battered cobbles, cobble spall tools and utilized flakes are ubiquitous within Tucannon phase tool assemblages and indicate that considerable time was spent grinding, cutting, and scraping by Tucannon folk. Knives are largely absent within Tucannon phase assemblages despite the abundance of other cutting tools, although seam knifes appear to be common at 10NP143 (Ames et al. 1990). Leonhardy (1970) believes that this low number of knives may be explained

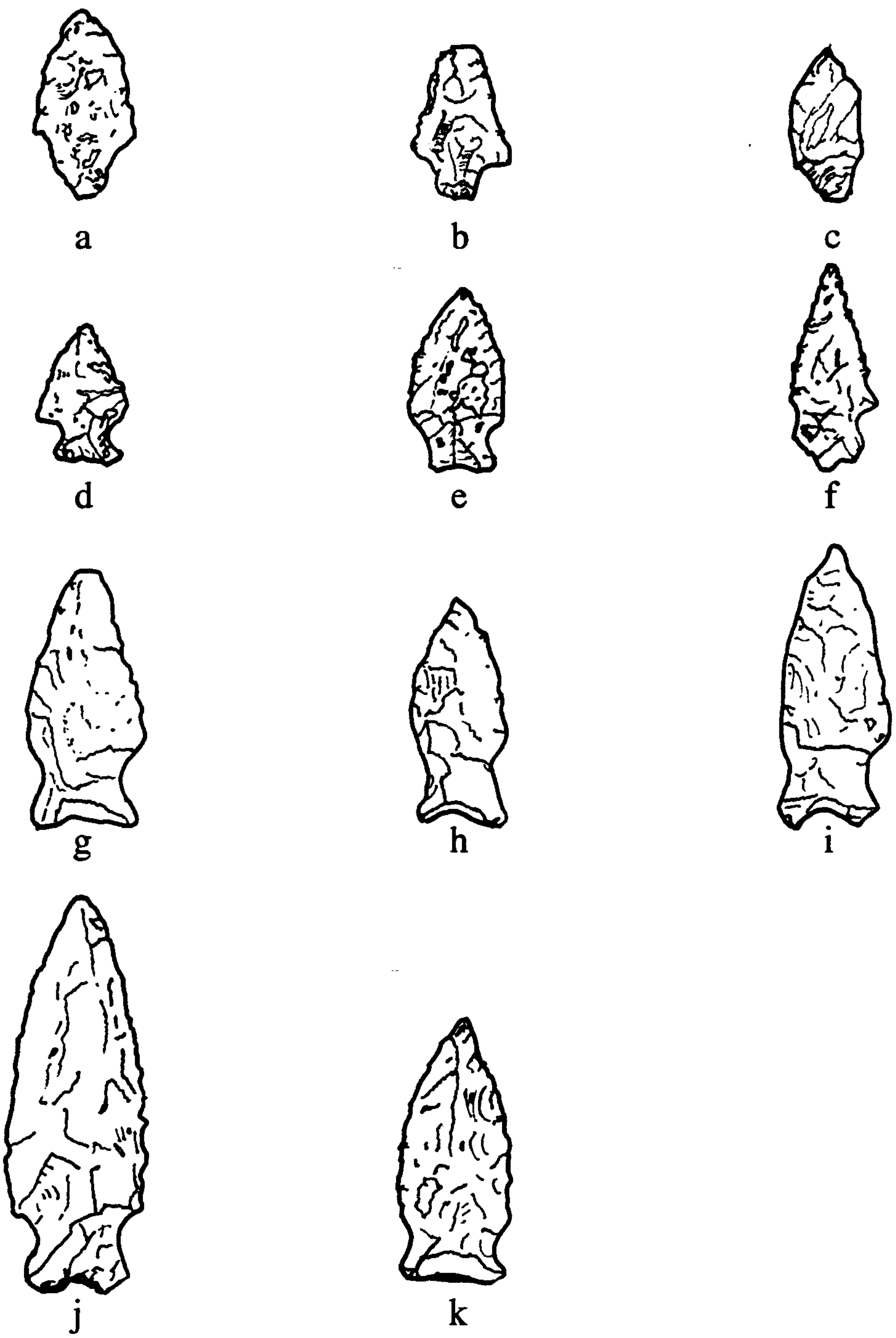

Fig. 7. Tucannon phase projectile points: a-c, contracting stem (45CO1); d-f, side or corner-notched expanding stem (45CO1); g-k, side-notched concave base (g-i, 45AS82; j-k, 10NP143). Scale 1:1.

by the high number of expedient cutting tools such as utilized flakes and cobble spalls found in assemblages typically assigned to the Tucannon phase. Indeed, Ames et al. (1990) have reported small Tucannon phase tools as being largely opportunistic in nature.

Fishing gear is not well represented for the Tucannon phase and consists of a few net sinkers from 45WT41, 45AS41 and 10NP143 as well as several net shuttles.

Lithic technology of the phase has not been well reported and suffers from inconsistent terminology. Brauner (1976) has reported Levallois-like (cf. Muto 1976) cores and flakes associated with the early Tucannon phase house at 45AS82. Unfortunately lithic technology at other Tucannon phase sites has gone largely unreported in the archaeological literature. Ames et al. (1990) have said that little effort appears to have been invested in the manufacturing of tools. Brauner (1976:298) has characterized the appearance of Tucannon phase projectile points by stating:

> Craftsmanship was de-emphasized. Symmetry and thickness were of little concern. Flake scars were generally broad and randomly placed. The lithic technology has been described as "not well developed" in contrast to earlier and later materials (Leonhardy and Rice 1970:11).

Faunal Remains

Mammals exploited during the Tucannon phase were similar to those utilized during other periods of prehistory within the Lower Snake River Region (Leonhardy and Rice 1970) (Table 1). Deer, elk, antelope and mountain sheep were routinely taken along with other mammals such as bison, rabbit, squirrel, gopher, fox, raccoon, beaver, badger, marmot, porcupine, coyote, various rodents and possibly lynx. Bear and dog remains have also been found within House 1 at Hatwai (Ken Ames, personal communication 1994). Aquatic resources known from Tucannon phase assemblages include salmon, unidentified fish, river mussel and river otter. Reptiles are represented by turtles and snakes. Avian fauna are poorly represented and known only by grouse, duck and unclassified bird remains (Leonhardy 1970:159; Brauner 1975:5 and 1976:149,160,193; Brauner et al. 1990:74,89).

Tucannon folk routinely exploited all habitats available to them. Based on current evidence, terrestrial resources appear to have been utilized, or were available for exploitation, more than aquatic or avian fauna with the exception of river mussel which was intensively collected by occupants of many Tucannon phase sites. The importance of river mussel in the Tucannon phase economy will be returned to in the final chapter.

Category	Common Name	Scientific Name	45WT41	45AS41	Alpowa	45WT134	10NP143
Molluscs							
	River Mussel	*Margaritifera falcata*		X		X	
	River Mussel	*Gonidea angulata*				X	
	River Mussel	????	X				
Fish							
	Salmon	Salmonidae				X	
	Salmon	*Oncorhynchus sp.*			X		
	Fish	*Pisces*	X	X	X		
Reptiles							
	Turtle	*Testudines*			X		
	Western Painted Turtle	*Chrysemys picta*				X	
	Snake	*Serpentes*			X		
	Snake	????				X	
Mammals							
	Rodents	????	X	X			
	Rabbit	????	X	X			
	Nuttall's Cottontail	*Sylvilagus nuttallii*			X	X	
	Pygmy Rabbit	*Sylvilagus idahoensis*				X	
	Jackrabbit	*Lepus sp.*			X	X	
	Ground Squirrel	*Spermophilus sp.*				X	
	Washington Ground Squirrel	*Spermophilus washingtoni*				X	
	Pocket Gopher	*Thomomys sp.*			X	X	
	Northern Pocket Gopher	*Thomomys talpoides*				X	
	Great Basin Pocket Mouse	*Perognathus parvus*				X	

Table 1. Fauna associated with Tucannon phase archaeological sites.

	Bushy Tailed Wood Rat	*Neotoma cinerea*				X	
	Montane Vole	*Microtus montanus*				X	
	Meadow Vole	*Microtus pennsylvanicus*				X	
	Sage Vole	*Lagurus curtatus*			X	X	
	Vole	*Microtus sp.*			X	X	
	Marmot	*Marmota sp.*				X	
	Porcupine	*Erethizon dorsatum*			X		
	Beaver	*Castor canadensis*			X		
	River Otter	*Lutra canadensis*			X	X	
	Raccoon	*Procyon lotor*				X	
	Badger	*Taxidea taxus*				X	
	Red Fox	*Vulpes fulva*			X	X	
	Dog/Coyote	*Canis sp.*	X	X	X	X	X
	Deer	*Odocoileus sp.*	X	X	X	X	
	Elk	*Cervus sp.*	X	X			
	Elk	*Cervus elaphus*				X	
	Elk	*Cervus canadensis*			X		
	Pronghorn Antelope	*Antilocarpa americana*			X	X	
	Antelope	????	X				
	Mountain Sheep	*Ovis canadensis*			X		
	Bison	*Bison Bison*			X		
	Bear	*Ursus*					X
Avian							
	Mallard Duck	*Anas platyrhynchos*			X		
	Sharp-tailed Grouse	*Pediocetes phasianellus*			X		
	Bird	*Aves*			X		

Table 1 (Continued)

Mortuary Practices

Little can be said concerning the customs associated with burial activities of the Tucannon phase. Our knowledge of such events is limited to one known burial (burial #12) at 45FR50 (Rice 1969). Kennedy (1976:149) reports that disagreement exists as to whether this burial was a flexed burial or a collection of unarticulated broken bones. Grave goods associated with the internment include a crude biface, a bone pendant, two *Olivella* shell beads, a graphite bead and a projectile point (Rice 1969:81). Other burials from 45FR50 may be associated with the Tucannon phase occupation of the site, but remain unassigned at this time. Gary Breschini (1979) in his review of burial casts from 45FR50 reports five burials (numbers 6, 7, 8, 9B and one unnumbered burial) immediately post-dating Mazama tephra-fall. Although these burials may have contemporaniety with the Tucannon phase, their exact temporal association remains unclear.

Recognized Changes Within the Tucannon Phase

Changes within artifact forms and features of the Tucannon phase from previous forms of the Cascade phase reported by Bense (1972) and others, are notable.

Settlement patterns associated with Tucannon phase occupation of the lower Snake River are markedly different from those associated with the Cascade phase. Sites associated with the former phase are scattered throughout the lower Snake River and form a common component to many archaeological sites. Sites associated with the Tucannon phase are uncommon along the same stretches of river that previously had provided an apparent high degree of livability for Cascade folk. Given the lack of evidence for increased rates of mortality during the Tucannon phase, absence of Tucannon phase components within archaeological sites of the Lower Snake River Region appear to indicate people had distributed themselves across the landscape differently than during the Cascade phase time period. Whether the people resided within areas of the river canyon not yet sampled by archaeologist, or removed themselves to areas outside the canyon is paramount to understanding how Tucannon folk adapted themselves to their surrounding environment. A discussion of this problem will be returned to in the final chapter.

Based on current information the apparent introduction of semisubterranean houses to the Lower Snake River Region occurred during the Tucannon phase time period. House 5 at 45AS82 was reported as a late Cascade phase house by Brauner (1976:289), but is considered here an early Tucannon phase house based on its mixed Cascade/Tucannon phase tool assemblage.

Distinct changes in the Tucannon phase tool kit from that of the Cascade phase is perhaps the most recognizable difference between the two cultural manifestations. Projectile point forms of the Tucannon phase are varied and seem to indicate intense intra-regional development of similar ideas. Cascade phase points are characterized by lanceolate and side notched forms and are largely void of intra-regional variation.

Other tool forms common to Cascade phase assemblages such as knives and edge-ground cobbles (Bense 1972:50) are not well represented within Tucannon phase assemblages. Similarly, tools such as hopper mortars and pestles which occur in Tucannon phase assemblages with regularity, are apparently rare in Cascade phase assemblages.

Well made tool forms of the Cascade phase are replaced by forms that appear "crude and impoverished" (Leonhardy and Rice 1970:14) during the Tucannon phase.

What little evidence existing for Tucannon phase lithic technology (cf. Brauner 1976) mirrors the Levallois-like technology reported for the Cascade phase by Leonhardy et al. (1971) and Muto (1976) and hints at homogeneity between ethnic groups of the two time periods.

Bense (1972:44) reports that deer, elk, antelope, fish and mussels were commonly exploited by Cascade phase people, however Leonhardy and Rice (1970) indicate that mussels were largely utilized only during the Tucannon phase. The large usage of river mussel during the Tucannon phase is unquestionable. The relative lack of fish remains during the phase seems to reflect a change in availability and/or exploitation of this aquatic resource.

Comparisons of mortuary practices between the Cascade and Tucannon phases are hindered by the lack of known burials reported for the latter time period. Bense (1972) reports the occurrence of 13 burials at 45FR50 for the latter part of the Cascade phase, while only one known burial was reported from the site associated with the Tucannon phase (Kennedy 1976). Disagreement concerning the type of burial represented by this one internment (Kennedy 1976) shows dubious potential for its interpretive value.

IV ENVIRONMENTAL SETTING

Investigations of change within the cultural systems of hunter-gathers are not complete without an understanding of the environmental setting associated with the period of transition. Peter Gould (1969:234) has said "Unfortunately, we have all too often lacked, or failed to consider, conceptual frameworks of theory in which to examine Man's relationship to his environment, the manner in which he weighs the alternatives presented, and the rationality of his choices once they have been made."

Researchers working on the Columbia Plateau have in some instances resisted environmental transition as a causative factor for culture change (cf. Warren 1968, Jaehnig and Lohse 1984, Lohse and Sammons-Lohse 1986). Greg Burtchard (1981:22) accentuated this concept when he stated:

> I maintain here that long term climatic change is inadequate to explain changing modes of human adaption in the [Columbia] Basin. I am aware of postglacial environmental change and its supposed effect on human adaption. It seems unlikely that changes would have been adequate to significantly alter the broad-scale vegetational and faunal patterns...In the absence of mechanisms to explain the effect of environmental changes on the involved human systems, archaeologists might be better served to concentrate on the relationship between population growth and resource balance to explain culture change rather than on simple environmental (climatic) change and culture change.

As no direct evidence is presently available to support population growth or other anthropogenic means for the inception of the Tucannon phase within the Lower Snake River Region, a review of the mid-Holocene environment and its potential effects upon, and coincidence of occurrence with, changing cultural systems appears warranted.

General Environmental Models

Researchers attempting the reconstruction of various paleoenvironments of the western United States have utilized a broad array of geologic, glacial, faunal and botanical evidence in building general environmental models. Two of these models that have been used with regularity by archaeologists studying cultural/environmental relationships are those proposed by Henry Hansen (1947) and Ernst Antevs (1948).

Hansen (1947) utilized palynology to reconstruct the climatic history of the postglacial Northwest. Results of his study pertinent to the understanding of past climatic regimes in and around the Lower Snake River Region come from pollen samples collected from coulees of the Channeled Scabland area of eastern Washington. Based on the relative abundance of grass and Chenopod-Composites within the pollen samples, Hansen (1947) divided the late Pleistocene and Holocene into four climatic periods. Period I was characterized as cool and wetter lasting until approximately 14,500 B.P. Period II, encompassing the end of the Pleistocene, extends to around 8,000 B.P. This period is recognized as dryer and warmer than the previous period, but probably cooler than conditions of today. Period III represents a time of maximum warmth and dryness lasting until approximately 4,000 B.P. Period IV encompasses the last 4,000 years and is cooler and wetter than the previous period. Kennedy (1976) has recalibrated Hansen's (1947) temporal scheme which was developed without the aid of radiocarbon dating (Fig. 8). The resulting trend in pollen abundances over time remains the same, however their temporal distribution has changed.

Antevs (1948) proposed three climatic episodes which together constitute the Holocene or his *Neothermal*. His three climatic episodes were a product of geologic studies conducted in the southwestern United States. Bense (1972:1) summarizes Antevs' (1955) description of these periods:

> Anathermal: (10,500 to 7,500 years B.P.)--This episode is characterized by a recession of the ice sheets, glaciers, and pluvial lakes. The prime factor was probably a general temperature rise. This increased the evaporation, and the ice sheet retreat made the belt of heaviest precipitation retreat northward. Although this episode was considerably warmer than the preceding glacial conditions, it was cooler and more moist than present conditions.

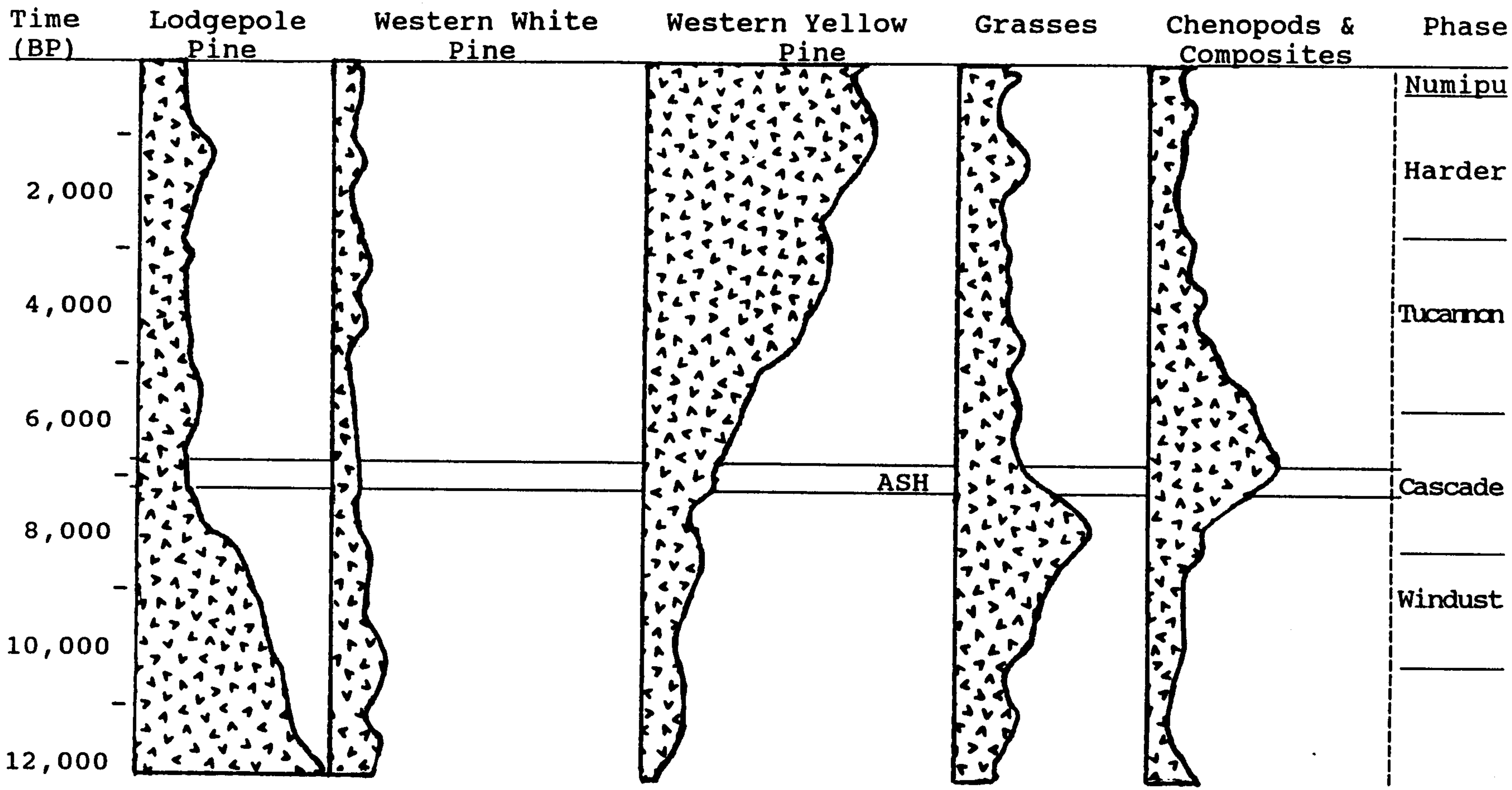

Fig. 8. Temporally adjusted pollen profiles of Columbia Basin sedimentary columns. Modified from Kennedy (1976:38).

Altithermal: (7,500 to 4,500 years B.P.)--This period is characterized by warmer and drier conditions than the Anathermal or present conditions. The southwestern United States saw a rise in the abundance of grasses, a complete or essential disappearance of permanent ice in the western mountains, and prevalent wind erosion. The beginning of the Altithermal has been set at the attainment of temperature of a distinctly higher level than present.

Medithermal: (4,500 years B.P. to present)--This climatic episode is characterized by modern conditions. The initiation of this episode is seen in the decrease in frequency of xerophytic plants, accumulation of water in desert basins, and a stabilization of dunes by vegetation, arroyo filling, and the development of wet meadows.

The two general climatic models are thus similar in construct and reflect similar patterns of environmental oscillations across the western United States during the Holocene. Hansen's (1947) Period II is similar to Antevs (1948) Anathermal period and Hansen's (1947) Period III reflects Antev's (1948) Altithermal. Similarly, Antev's (1948) Medithermal climatic period generally corresponds with Hansen's (1947) Period IV.

Both models reflect a warm, dry period truncated by a return to wetter and cooler conditions between 4,000 B.P. to 4,500 B.P. This return to a wetter and cooler period is further reflected by glacial ice advances in mountains of the West at the start of the Medithermal climatic episode (Porter and Denton 1967). G.H. Denton and W. Karlan (1973), and C.D. Miller (1969) in Schalk and

Cleveland (1983) have also shown glacial ice advances for the Northwest between 5,800 B.P. and 4,900 B.P. Additionally, B. Robert Butler (1978) reports a period of glaciation for the northern Rocky Mountains between 5,300 B.P. and 4,000 B.P.

The actual timing and duration of each climatic episode probably varied between western regions and environmental fluctuations within each period undoubtedly occurred without altering the general characteristic of that period. Thus, local climatic sequences are needed to discern the specific presence and magnitude of each period within a given locale.

Local Climatic Studies

The Snake River drains a vast geographic area, supporting runoff from portions of six western states and three drainage sub-basins (Muckleston 1985). Because people living along the lower Snake River were largely dependent on the biotic communities supported by the river, investigations of paleoclimatic conditions upstream and within tributary drainages are needed to fully understand the river's flow regime and resulting effect on biotic resources.

Northern Great Basin

Peter Mehringer (1986) has reported evidence for a brief increase in effective moisture for the Great Basin between 6,000 B.P. and 5,000 B.P., while Butler (1978) has proposed a period of cooler, wetter conditions for the northern portion of the Great Basin during the same time period. Pollen profiles at Fish Lake and Diamond Pond from the Steens Mountain area of southeastern Oregon indicate decreasing amounts of sagebrush and increasing amounts of grass, juniper and charcoal starting at approximately 5,400 B.P. (Mehringer and Wigand 1986). These increases suggest a return to cooler and wetter conditions and a rise in the regional water table. At approximately 4,000 B.P. pollen counts for all three rise significantly and remain high until approximately 2,000 B.P. when they return to values characteristic of the time period from 5,400 B.P. to 4,000 B.P.

Reid et al. (1989) have summarized Peter Wigand's (1987) work and state that a transition to more mesic conditions at Diamond Pond may have started as early as 5,400 B.P. with replacement of greasewood pollen by pine pollen. They further state "From 3,800 to 3,600 B.P., the greatest late Holocene juniper grass expansion at Diamond Pond corresponds to the most dramatic single increase in the regional water table during the last 6,000 years" (Reid et al. 1989:80).

Draper and Reid (1986) report that a period of increased effective moisture began at 4,000 B.P. in the northern Great Basin based, in part, upon evidence within stratigraphic sequences from rockshelters and caves from the Snake River Plain. Plew et al. (1984) have also reported a period of increased effective moisture at 4,000 B.P. in southern Idaho based upon sediments within archaeological sites of the region. Ames (1982) noted that the absence of archaeological sites on the South Fork of the Payette River before 4,000 B.P. may be related to geomorphic processes. He also reports that a period of increased effective moisture was responsible for alluvial fan construction on the river at 4,000 B.P.

Lake levels of the northern Great Basin appear to fluctuate and reflect changing xeric and mesic conditions of the region as well. Ruth Greenspan (n.d.) notes that the appearance of fish in Fort Rock Basin archaeological sites at 4,300 B.P. indicate a reemergence of lake levels associated with a period of increased effective moisture. Mehringer and Wigand (1986) report that deep water episodes at Malheur Maar also coincide with an increase in effective moisture indicated by the high amounts of grass, juniper and charcoal in pollen profiles from the Steens Mountain area at 5,400 B.P.

Blue Mountains

Bruce Cochran and Frank Leonhardy (1981) developed an alluvial chronology for the Blue Mountains of northeastern Oregon. Based upon their work at the La Grande Sites (35UN52, 35UN74 and 35UN95), five alluvial cycles were noted that were each followed by a period of soil formation and episodes of erosion. The first period of deposition began at about 10,700 B.P. and lasted until just before the eruption of Mt. Mazama at 7,000 B.P. whereby an erosional episode removed portions of the alluvium. Mazama ash and alluvium were then deposited at the sites and then truncated by an erosional episode prior to 5,700 B.P. Deposition occurred again from just prior to 5,700 B.P. until another period of erosional activity occurred at approximately 4,000 B.P. This particular period of erosion is not well documented at the sites however. Deposition began again at or near 4,000 B.P. and continued until after 2,900 B.P., but ended well before 1,550 B.P. Another erosional episode occurred before 1,550 B.P. followed by a period of aggradation that lasted into the historic period (Cochran and Leonhardy 1981:26).

Cochran and Leonhardy's study serves as an intermediary chronology between the northern Great Basin and the Lower Snake River Region of the southern Plateau. Their results are similar to:

> other sequences on the Lower Snake River and Columbia River of central and southeastern Washington (Cochran 1978; Fryxell et al. 1968; Hammatt 1976; Marshall 1971; Pavish 1973). Since these sequences are widely separated and are situated in different geographic-geomorphic environmental settings, factors controlling synchronous deposition, soil formation, and erosion must have been nearly the same (Cochran and Leonhardy 1981:5).

Lower Snake River Region

Roald Fryxell and Richard Daugherty (1963) compiled a general chronology of post glacial climatic events for the Columbia Plateau area. Based on the relative amounts of rockfall detritus, eolian sedimentation and organic debris from within cave and rockshelter sites, they discerned three general climatic periods that adhere to Hansen's (1947) and Antevs' (1948) models. Their model recognizes the time period prior to 8,000 B.P. as cool and wetter characterized by vigorous frost activity. From 8,000 B.P. to approximately 4,000 B.P. a trend of lessened frost activity occurred accompanied by eolian sedimentation. From sometime between 4,000 B.P. to 2,000 B.P. conditions became cooler and wetter than the previous period and were similar to those of today. Regarding the period between 8,000 B.P. to 4,000 B.P., Fryxell and Daugherty (1963:14) stated that:

> ...flood-plain loess was deposited and ventifacts were polished below the present low-water surface of the Columbia River; many tributary streams were unable to maintain open channels or to discharge run-off to the Columbia...and mudflow activity on both talus slopes and alluvial fans was reduced.

In 1971, Alan Marshall documented an alluvial chronology for the lower Palouse River. Six terraces reflecting erosional episodes separated by periods of deposition and/or soil development over the last 10,000 years were documented. Of interest to this study are the mechanisms responsible for the construction of terrace II and terrace III. Terrace II was a result of a post Mazama erosional episode that roughly dates to 5,700 B.P. (Marshall 1971:41). Based on particle size analysis of gravel, this episode of erosion was less turbulent than other such episodes within the river canyon. In comparison, terrace III appears to have been cut by an erosional episode that was considerably more severe than other erosional episodes. Terrace III is probably slightly older than 4,000 B.P. (Marshall 1971:36). Both erosional episodes were followed by periods of lower water levels within the Palouse River that were characterized by soil formation and deposition on exposed terraces.

Paleoenvironmental investigations at Seed Cave (Thompson 1985) along the lower Snake River have shown that based upon faunal and sediment data, a period of wetter conditions from those of the Altithermal prevailed from approximately 4,100 B.P. to 3,500 B.P. Rock fall frequencies were more abundant after 4,100 B.P. than from 7,900 B.P. to 4,100 B.P. Notable rock fall events were nearly absent from levels associated with Altithermal deposition within the cave. However, in reanalyzing Thompson's (1985) data for this study, the levels between 343 cm to 378 cm below the surface appear to commonly contain angular roof spall in a large size class not present within the cave since before 7,900 B.P. Thompson (1985:22) notes that the overall rates of deposition within the cave varied little throughout prehistory. Because the 343 cm to 378 cm levels are grossly bracketed by dates of 4,100 B.P. and 6,400 B.P., the levels containing the large roof spall may have been active between 5,200 B.P. to 5,300 B.P. and indicate a period of cooler, wetter conditions.

Kennedy (1976) noted that all of the Tucannon phase assemblages used in his validation study were associated with alluvial sediments containing local disconformities or erosional periods. Evidence, however, for erosional and/or alluvial periods following Mazama ash deposition during the Altithermal, but prior to the heretofore reported date for the inception of the Tucannon phase and Medithermal climatic episode have been documented within the Lower Snake River Region as well. At Granite Point Locality I, an erosional episode occurred after the time

Mazama ash was deposited and before the deposition of floodplain material at 4,000 B.P. (Leonhardy 1970). A similar event is documented at 45CO1 where a wide spread erosional episode occurred after Mazama ash deposition, and slightly before the prominent deflation of assemblage 3A housing Tucannon phase artifacts (Nelson 1966). At Hatwai, Ames et al. (1981) have also documented the occurrence of five alluvial cycles between 6,250 B.P. and 5,000 B.P. Citing a personal communication with J. Davis, Kennedy (1976:47) notes that an erosional episode at the Henley Site (45WT114), located ten miles up Alkalai Flat Creek from the Snake River, was dated at approximately 5,250 B.P.

Channeled Scablands of Eastern Washington

After temporally adjusting Hansen's (1947) pollen profiles for the Columbia Basin, Kennedy (1976:38) shows an increase of grass pollen occurred within the sedimentary columns of the region at approximately 5,300 B.P. and again at approximately 4,700 B.P. (Fig. 8). The levels of grass pollen represented during these time periods are the highest recorded values shown for any period of the mid post-glacial and appear to reflect a period of increased effective moisture for the region.

Late Altithermal Climate

The above data generally reflect increasing wetness during, and following, the waning periods of the Altithermal climatic episode or *Thermal Maximum* (cf. Hansen 1947). At approximately 5,500 B.P. a period of increased wetness is evident that occurs nearly 1,500 years prior to the period of increased wetness associated with the inception of Ernst Antevs' (1948) Medithermal climatic episode. This period is characterized by increased effective moisture resulting in higher regional water tables and episodes of alluvial deposition and erosion, as well as glacial ice advances. Erosional events responsible for terrace construction would have produced increased rates of sedimentation from the down-cutting of stream floors as well as from the scouring action of older terrace faces. Stream channels previously inactive would have began discharging sediment buildup within corridors largely void of riparian vegetation. Vegetation along previously active stream courses would likely have been removed along with stream-side soil. Aquatic fauna dependent upon various aspects of the stream channels would have been subjected to varying degrees of habitat degradation. Talus reactivation would likely have occurred along with rockfall within shelters and caves. Hydrophilous flora would have expanded at the expense of drought tolerant species. Fauna associated with, or dependent upon, expanding plant and shrub communities would have increased in numbers as well.

The foregoing examples document pan-regional trends of climatic occurrences as well as events specific to given locales during the mid-Holocene. Attention now turns to the significance of these events as manifest within the archaeological record.

V ORIGIN OF THE TUCANNON PHASE

Changing economic conditions associated with the height of Altithermal desiccation led Richard Daugherty (1962) to postulate significant population movements to southern Plateau river courses. Luther Cressman (1960) had previously reported the Fort Rock Cave locality appeared to have been abandoned during the same time period. If northern Great Basin populations had migrated to the Lower Snake River Region of the southern Plateau, the material culture of the Region should reflect their presence during the Altithermal time period. However, it does not. Although Brauner (1976) has shown similarities within projectile point styles between the northern Great Basin and the Lower Snake River Region for the Tucannon phase time period, he did not propose replacement by Great Basin populations, but rather influence by them. Ames et al. (1990) attribute the notable change in lithic workmanship during the phase not to cultural displacement, but to changes in economic emphasis. Further, John Fagan (1973, 1974) has shown that the northern Great Basin was probably not abandoned as proposed by Cressman (1960), but rather experienced a population shift to the uplands there as an adaptive response to the desiccation of lowland lacustrine environments. Although Kennedy (1976) has reported internal consistency problems for the Tucannon phase time period, the aberrant results of his tests do not necessarily indicate displacement of lower Snake River folk by northern Great Basin populations. A discussion of Kennedy's (1976) internal consistency tests will be returned to in the final chapter.

Thus, because the Tucannon phase appears to have been an historical outgrowth of the previous Cascade phase, its origin is necessarily derived from the adaptive responses employed by Cascade people to their changing environment. The quality of change manifest within this response was commensurate with the stress acting upon Cascade people's cultural systems.

The natural setting of human populations have a profound effect upon their technology. Social relationships and ideological spheres also influence technology (Sahlins and Service 1960, Suttles 1968), but it is technology itself that perpetuates the existence of these components (White 1949). Leslie White (1949) refers to these component's influence upon technology as one of conditioning rather than solely determining.

The magnitude of the Cascade/Tucannon phase transition has already been discussed. Attention now turns to principals inherent within cultural systems that govern culture change.

Cultural Conservatism and Specific Evolution

Hunter-gathers by virtue of their economic existence are tied closely to their environment and thus possess fewer cultural subsystems than agrarian based economies. The energy required for systemic maintenance is thus less, but still demands the catchment of similar levels of energy that are expended, in order to sustain system operations. Adaptive modifications, or specific evolution, serve to fix energy requirements and appropriate more when times of stress dictate it necessary to do so (Sahlins and Service 1960).

Sahlins and Service (1960) have suitably capsulized factors within cultural systems that govern culture change. Their *Principle of Stabilization* characterizes the conservative nature of cultural systems by noting "that a culture at rest tends to remain at rest" and "the ideals and values of most cultures take continuance and changelessness for granted" (1960:54).

Adaptive modifications within a culture's subsystems enables the conservation of the whole and allow cultural subsystems to remain at rest. These modifications or devices are drawn from the resources a culture has at its disposal or that can be borrowed from the outside, and serve to counter dysfunctional system stress by enhancing systemic functioning. Specific evolution occurs when the need for adaptive modifications arise. The quality of this modification is relative to the adaptive problem. A culture's subsystems will operate at a level that is commensurate with the need to maintain its structure. Sahlins and Service (1960:34) have stated "An increase in efficiency may not be directed toward any advance whatsoever if the existing adaption cannot accommodate it or selective pressures remain insufficient to induce it." Thus cultural subsystems conservatively change only enough to prevent the necessity of greater culture change (Sahlins and Service 1960). The resulting periods of "standardization" relative to and within the archaeological record are subsequently used by archaeologists in formulating stationary interpretive units such as phases (cf. Willey and Phillips 1958).

Systems Inquiry

A system may be thought of as two or more interrelated components that are connected in such a way that a change in one component will cause change within other components of the system until a new equilibrium is reached. That one component of the system is responsive to other components of the system serves to demonstrate homeostatic mechanisms at work that act to keep a system in balance. These mechanisms work to establish order and stability within a system when modification or stress has occurred to that system.

Equilibrial shifts may occur within systems without disrupting the total system. These fluctuations move the point of system equilibrium around within a system without causing change to the structure of the system. The point of equilibrium simply reestablishes itself within the confines of the preexisting system structure.

James Hill (1977:62) points out that like biotic systems, social systems have levels or ranges of tolerance. When environmental stress threatens to overload a system's tolerance level and force it beyond its normal realm of operation, homeostatic mechanisms from within work to bring the system into balance. A breakdown or insufficient adjustments within these mechanisms lead to system chaos and change. While it is the character of cultural systems to resist change during times of stability they must also contain the provisions for reacting to change and incorporating new adaptive modifications during times of stress (Turney-High 1968).

Turney-High (1968:68) has explained system stress or crisis as "...any serious change for which an adequate built in answer does not exist, but one for which an adequate answer must be found if the system is to retain its present form." Mabel Elliott and Francis Merrill (1934) have eluded to the causative nature of change by delineating system crisis into two forms, precipitate and cumulative crisis. Precipitate crisis may be defined as a sudden change induced upon the system. Cumulative crisis is perhaps more appropriate for the processes of culture change in that it results from the gradual buildup of dysfunctional components within a system which ultimately leads to system chaos. Integrity of the system's structure will persist unless these dysfunctions ultimately transform the basic institutions of the system (Kaplan and Manners 1972).

Numerous mechanisms within a system provide potential "slack" capable of absorbing stress. One or more homeostatic mechanisms may suffice to temper the effects of stress upon the system, however, it may occur that all such mechanisms capable of providing a dampening effect are called into play in an attempt to establish stability, and fail. Breakdown within the system thus results from its inability to absorb stress or provide suitable alternatives or innovations that effectively counteracts the stress.

Adaptive specialization is the unavoidable result of a culture adjusting to the environment in which it is found (Sahlins and Service 1960). Due to their nature, adaptive specializations may later develop as latent disfunctioning components of a culture that preclude the ability to absorb change or stress within a system.

<u>Systemic Implications of Cascade Phase Technology</u>

Judith Bense (1971, 1972) has reviewed the effects of the Altithermal climatic episode on Cascade phase cultural systems. She noted:

> The stability of this pattern is indicated not only by artifacts, but also by evidence of exploitative economy and settlement pattern. A hunting-gathering-fishing exploitative economy and dispersed non-nucleated settlements characterize the basic ecological adaptations. There is no evidence of change (1972:96).

Her assumptions concerning no evidence for change may have merit relative to the legitimacy or internal consistency of the phase as an archaeological unit, but are not entirely adequate concerning internal adjustments made by Cascade folk to their environment during the phase. As noted above, internal adjustments within cultural subsystems act to keep a system in balance to prevent programmatic culture change. Through discreet adaptive modifications, Cascade folk were able to continue their "hunting-gathering-fishing exploitative economy" (Bense 1972:96) without a disruption to their total cultural system for well over two millennia.

Notable evidence for improved structure or improved functioning of existing system structures (cf. Sahlins and Service 1960) within the Cascade phase may be demonstrated by the appearance of the Cold Springs side-notched (cf.

Shiner 1961, Butler 1961) projectile point and inferred weapons system immediately following the eruption of Mt. Mazama at 7,000 B.P. Adaptive modifications specific to the Cascade phase are not in themselves directly relevant to discussions concerned with the mechanisms responsible for inception of the Tucannon phase. However, a review of the choices made by Cascade people, and why, appropriately demonstrate fundamental aspects of their economic organization and setting which do in turn play a major role concerning the <u>why</u> behind the inception of the Tucannon phase.

Although the presence of the side-notched projectile point is well represented within archaeological sites of the Lower Snake River Region, there has been little discussion concerning its associated weapon system's role in contributing to the overall stability of Cascade phase culture. In keeping with Sahlins and Service's (1960) *Principle of Stabilization*, a culture, and subsystems thereof, do not change unless forced to do so. Introducing intentional variation to subsystems critical to overall system survival presents a high degree of risk to that system. Hunter-gathers are too closely tied and dependent upon their natural environment to suffer economic loss due to failed fortuitous experimentation. Only in time of culture-stress is experimentation a viable exercise. Therefore, it is assumed here that Cascade people adopted the side-notched projectile point's accompanying weapon system as an adaptive modification meant to counter system stress. The weapon system served to dispatch fauna found within the environment Cascade people had adapted themselves to, and as such was a critical adaption to their environment.

The idea or template for the Cold Springs side-notched point and weapon system probably originated outside of the Lower Snake River Region. Both the Bitterroot side-notched (Swanson and Bryan 1964) and Northern side-notched (Gruhn 1961) points occur earlier than the Cold Springs side-notched point in east-central Idaho and the northern Great Basin, respectively. Bense (1972) has reported that the Cold Springs side-notched point of the Lower Snake River Region is morphologically and technologically dissimilar to the Northern side-notched point of the Great Basin. Conversely, the Cold Springs side-notched point is very similar to the Bitterroot side-notched point from Idaho (Bense 1972:88). Earl Swanson and Frank Leonhardy (1972) also indicate that the Bitterroot point was the progenitor for the Cold Springs form.

The Bitterroot side-notched point first occurs during the later part of the Birch Creek phase of east-central Idaho (Swanson and Bryan 1964). Earl Swanson (1972) in Robert Butler (1978, 1986) reports the first appearance of

Bitterroot side-notched points within the Birch Creek Valley between 7,200 B.P. and 8,200 B.P. Thus, people living in east-central Idaho were apparently using the side-notched point and accompanying weapon system some time prior to lower Snake River folk adopting the same apparent strategy. Butler (1978) believes the adoption of the Bitterroot side-notched point in Idaho is indicative of an atlatl and dart weapon system that spread west across the northern Intermontane Region from the northern Plains. That the residents of the Birch Creek Valley were using this particular weapon system may be useful in discerning its utility to Cascade people within the Lower Snake River Region.

The Birch Creek Valley of Idaho is a basin formed by the Lemhi Range to the west, Beaverhead Mountains to the east, Gilmore Divide to the north and high basalt ridges to the south. Birch Creek disappears at the southern end of the valley into the Birch Creek Sinks (Swanson and Bryan 1964). No anadromous fish species are located within the valley.

Upland hunting thus appears to have been a dominant activity by Birch Creek Valley folk throughout prehistory (Butler 1978). If residents of the Lower Snake River Region required a weapon system that could provide greater success in hunting upland game, then the adoption of the idea of the Bitterroot side-notched point and accompanying weapon system from their upland neighbors to the east, seems not unreasonable. The idea of the weapon system had persisted for roughly 1,000 years in east-central Idaho, prior to its proactive diffusion to the Lower Snake River Region. Cascade folk were undoubtedly aware of its existence, but had no reason to select for it prior to 7,000 years ago.

Why Cascade folk added a new weapon system to their cultural kit might be understood by reviewing the nature of the Cascade phase economy as well as the timing of the weapon system's introduction.

Richard Daugherty (1962) originally characterized the cultures of his Transitional Period as part of the *Northwest Riverine Tradition* based upon their intense utilization of aquatic resources located along the major streams and their tributaries. The time period associated with his Transitional Period has, within the Lower Snake River Region, been assigned to the Cascade phase (cf. Leonhardy and Rice 1970). It is well noted within the archaeological literature of the Region that Cascade phase sites are ubiquitous along the banks of the lower Snake River (Bense 1972, Kennedy 1976). Cascade folk exploited a wide array of habitats and resources as mobile foragers (Bense 1972). As hunter-gathers they also tended to locate themselves nearest those resources comprising the largest component of their economy (cf. Gibbon 1984).

That they were dependent upon aquatic resources, and particularly fish, is evident from the occurrence of salmonid remains within archaeological sites containing Cascade phase components (Galm 1975). Aquatic resources such as fish and to some degree river mussel probably contributed a large proportion of protein to Cascade people's diet. Terrestrial fauna were apparently important as well based on the quantity and assortment of their remains found within archaeological deposits. Avian fauna rounded out the protein diet of Cascade folk, but apparently served only as an occasional supplement.

The widespread occurrence of the side-notched projectile point stratigraphically above Mazama ash has prompted discussion that its weapon system may have served as an adaptive response to degraded habitats resulting from the effects of Mazama ash fallout (Galm 1975). Bense (1972) has noted that a few side-notched projectile points have been found below Mazama ash within the Lower Snake River Region, although the stratigraphic integrity of their location have been questioned. When viewed within a system's framework the notion that the side-notched projectile point's weapon system was an adaptive response to Mazama tephra-fall, does not seem unreasonable. The appearance of the new weapon system immediately following Mazama tephra-fall may also serve to explain its function as an adaptive modification. What resources may have been impacted by the results of Mazama tephra-fall, and how might the resulting systems' stress have been stabilized by the adoption of a new weapon system and accompanying hunting strategy?

Stephan Matz (1991) has reviewed the effects of Mazama tephra-fall on biotic communities. He reports the effects of non-violent tephra-fall deposition on large terrestrial animals are generally not as severe as on smaller fauna and juveniles. Limited data suggests that smaller mammals may also have relatively high survivorship even when found within the periphery of a vent source (Matz 1991:16). Aquatic species, however, are more likely to be impacted by tephra laden stream sediments. Matz has reported:

> After the 1980 eruptions at Mount St. Helens, Stober et al. (1982) studied the tolerance of Coho to suspended sediment. Live box bioassays of pre-smolt Coho salmon found that in 2022 mg/l mortality was 100 percent in 3 hours, at 11,429 mg/l mortality was 100 percent in 30 minutes, and at 1217 mg/l in 96 hours mortality was less than 10 percent (1991:16).

Harold Malde (1964) has postulated catastrophic consequences surrounding tephra-fall on the southern Plateau. He concluded that ash sediment within streams were responsible for the mechanical destruction of fish gills leading to widespread destruction of salmonid species within the area following the eruption of Mt.

Mazama. However, Gamblin et al. (1986) in Matz (1991) reported that 2 cm of St. Helens ash deposited into the St. Joe River drainage in Idaho had little or no effect on the abundance of fish species or the siltation of their spawning beds.

The relative levels of Mazama ash sediment within the streams of the Lower Snake River Region immediately following tephra-fall are not known. However, Matz (1991:41) reports locally heavy Mazama tephra deposits for the Lower Snake River Region (Fig. 9). The apparent heaviest accumulation (15-30 cm) of tephra-fall associated with the Mazama events are found within the Blue Mountains of northeastern Oregon. Leonard Fulton (1968) reports that spring and summer-runs of Snake River chinook salmon utilized a wide array of rivers and their tributaries within this area for spawning purposes. Cascade people living along the lower Snake River would have been dependent upon these and other runs of salmon for subsistence (Galm 1975). Large scale variation of these and other salmonid numbers would have had a commensurate effect upon the economic structure of Cascade people. Additionally, Mazama tephra-fall occurred at the height of the Altithermal or Hansen's (1947) *Thermal Maximum*. Warmer water temperatures, reduced stream flow, and closed channels (Fryxell and Daugherty 1963) associated with this

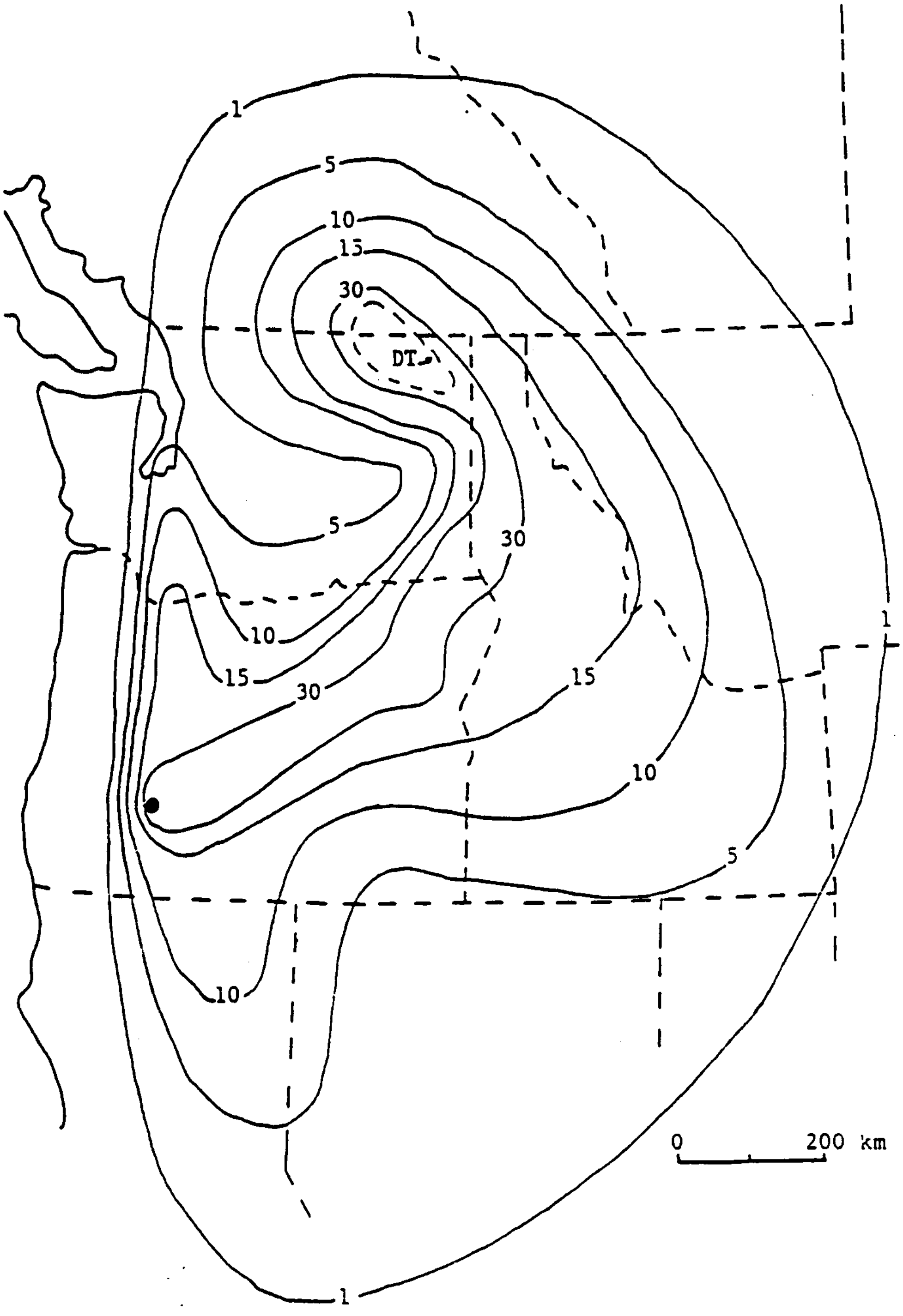

Fig. 9. Combined depth of Mazama tephra-fall events measured in centimeters (ca. 7,000 B.P.). From Matz (1991:41).

time period would have reduced salmonid habitat prior to Mazama tephra-fall impacting aquatic species further.

Bense (1972) has reported that the Altithermal climatic episode as well as the specific eruptive events of Mt. Mazama resulted in little or no effects on Cascade phase culture. This seems adequate given the consistency of Cascade material culture. However, Cascade folk did adjust to their surrounding environment as changes within their environment dictated they must.

The xeric conditions of the Altithermal may have resulted in lower deer and elk numbers in relation to antelope within the Lower Snake River Region (Gustafson 1972). The Mazama tephra itself apparently had little reported effect on terrestrial animals (Matz 1991). Evidence for impacts upon aquatic resources may indeed indicate that internal adjustments would have been necessary within Cascade cultural subsystems as abundance of salmonids within the Snake River system declined. Archaeological evidence does not indicate salmonid numbers were reduced below a practicable limit of exploitation during the Cascade phase. However, their numbers may have sufficiently reduced enough to impact Cascade people's economic structure largely patterned around the riverine environment. An adaptive modification may have been required to reintroduce stability within affected economic systems.

A weapon system tipped with the Cold Springs side-notched projectile point may have been adopted to fill in behind the partial economic void resulting from reduced salmonid abundance from Mazama tephra-fall, and/or lower numbers of deer and elk due to the xeric conditions of the lower Snake River canyon (cf. Gustafson 1972). Sahlins and Service (1960) have noted that adaptive modifications act to increase efficiency within systemic operations. This efficiency may result from more energy being captured per unit of effort, or the same amount of energy being captured with less effort. The advantage of the latter scenario enables reserved units of effort to be expended in other areas of system operation whereby increased energy yields there replace the energy initially lost within the system. This replacement of lost energy effectively restores stability within the system.

Assuming the side-notched projectile point was used as a part of a weapon system used in dispatching fauna, a comparison of early and late Cascade phase faunal assemblages may show which of the two above scenarios Cascade folk chose, or to what degree they employed either. Unfortunately, of the thirteen Cascade phase sites studied by Judith Bense (1972), only six contained reported faunal assemblages. Of these six sites only three (45FR50, 45WT41 and 45CO1) had information concerning the faunal remains respective to the early and late portion of the Cascade phase (eg. post-Mazama tephra-fall). Of these three, only two sites (45FR50 and 45WT41) had fauna reported in numbers allowing comparisons (1972:40).

Fish remains were not reported in numbers permitting comparison between the early and late portion of the phase (Bense 1972:40). Remains of ungulates from 45FR50 and 45WT41 indicate that elk and deer remains were dramatically less numerous in the latter portion of the phase. Pronghorn numbers only permit comparison between the early and late portion of the phase at 45FR50 where they too show a slight decrease in numbers during the late Cascade phase. Conversely, the unspecified category of "large sized animals" (Bense 1972:39) show that such fauna were, by far, more abundant in the latter portion of the Cascade phase at 45WT50.

The paucity of faunal remains reported from Cascade phase sites prohibit statements concerning genuine tendencies of Cascade folk concerning their protein preferences or the apparent abundance of fauna within their exploitative area during the latter part of the Cascade phase. The lack of data also does not support Bense's (1972) assumption that the xeric conditions associated with the Altithermal, in addition to the Mazama tephra-fall, had little or no effect on Cascade people's culture. Available faunal evidence may indicate the opposite.

Claude Warren (1968) and Charles Nelson (1969) have postulated that the *Cold Springs Horizon* (cf. Butler 1961), coincident with the latter portion of the Cascade phase within the Lower Snake River Region, was indicative of an increased use of food grinding implements. Bense (1972:91) reports that there was no increase in food grinding implements during the Cascade phase, but does not provide evidence for this assertion. Robert Keeler (1973:77) has reviewed Bense's (1972) data and suggests that there were differences between the early and later portions of the Cascade Phase. He reports that a predominance of, or addition of, side-notched points, triangular knives, milling stones, pestles and an antler digging stick during the latter part of the Cascade phase seems to suggest, in part, an emphasis on plant food procurement. Warren (1968) also includes river mussel as a distinctive element of the *Cold Springs Horizon* based upon large shell remains recovered at 35UM7 (Shiner 1961). Bense (1972:40) shows that river mussel remains have been reported from the three Cascade phase sites that permit comparison between early and late phase faunal assemblages. Exact numbers of mussel shell within each assemblage are not presented thus prohibiting detailed comparisons between the use or abundance of river mussel between the early and late portions of the phase. However, 45CO1 was completely lacking in shell remains during the early portion of the Cascade phase, but did possess shell remains during the latter portion of the phase. As with the lack of data for ungulates, lack of river mussel data within Cascade phase faunal assemblages preclude definitive statements concerning their use or abundance between the early and latter portions of the phase and cannot support Bense's (1972) assertion that there was no cultural response by Cascade people to the Altithermal or Mazama tephra-fall. Indeed what sparse evidence does exist, suggests the opposite may have been true. Keeler's (1973) account of increased plant food accouterments during the latter part of the Cascade phase also appears to conflict with Bense's recurring assertion.

A systems inquiry supports the addition of a new weapon system and associated hunting strategy due to stress within Cascade phase cultural systems and specifically that area of their economic structure responsible for harvesting protein. Reported faunal remains from both the early and late time periods of the phase do not indicate what efficiency the side-notched point may have brought to Cascade folk. Bense's (1972) assumption that no substantive change occurred to Cascade folk as a result of the Mazama tephra-fall or Altithermal is based largely upon the consistency of flaked stone artifacts found throughout Cascade phase components. Indeed, whatever stress may have been acting upon late Cascade phase culture was sufficiently dissipated or absorbed by internal adjustments made within their cultural subsystems. These adjustments allowed Cascade folk to remain Cascade folk, relative to the archaeological record, despite an apparent shift within their economic institutions.

The above synopsis of the late Cascade phase economy provides an historical basis for the inception of the Tucannon phase.

Timing of the Cascade/Tucannon Phase Transition

A terminal date for the Cascade phase is not well understood. Judith Bense (1972) reports that the latest radiocarbon date for the Cascade phase is 7,300±180 B.P. (WSU-170) from 45WT2 (Nance 1966). Late Cascade phase assemblages are commonly found stratigraphically overlying Mt. Mazama ash, which is dated to approximately 7,000 B.P. (Matz 1991). The inception of the Tucannon Phase certainly occurred well after Mazama tephra-fall, but how long after?

Charles Nelson (1965, 1966) recovered a late Cascade phase component at 45CO1 which he reported as part of Butler's (1961) *Cold Springs Horizon*. Following Butler, Nelson used Mazama ash as a basal date for this component and 4,000 B.P. as an upper limiting date. An upper limiting date for Butler's (1961) Horizon was apparently coeval with the end of Hansen's (1947) Period III that was developed without the use of radiocarbon dating, but roughly placed at approximately 4,000 B.P. The estimated 4,000 B.P. date at 45CO1 was also an approximation based upon the dated stratigraphic successions at Marmes Rockshelter located nearby (Nelson 1966:8). The 4,000 B.P. date also served as a lower limiting date for assemblage 3 at 45CO1 which was later assigned to the Tucannon phase by Leonhardy and Rice (1970). Nelson (1969:27) has further reported a radiocarbon terminal date for the *Cold Spring Horizon* in the Vantage area of the Middle Columbia at 4,200 B.P.

Radiocarbon dates from 45FR50 actually contribute little to our understanding of the timing of the Cascade/Tucannon phase transition. An aberrant date of 4,250±150 (WSU-207) derived from shell was not associated with geologic strata containing Cascade or Tucannon phase artifacts (Rice 1969:4). The date is probably more useful as a lower limiting date for stratigraphic Unit VII at the site. John Sheppard et al. (1987) in their review of the Marmes Rockshelter chronology have assigned WSU-207 to stratigraphic Unit V based on their belief that shell dates from the site are accurate due to their pairing with dates derived from charcoal. Although this argument may have merit they provided no tangible evidence that WSU-207 originated from stratigraphic Unit V.

A radiocarbon date of 5,145±200 B.P. (WSU-668) provided a lower limiting date for the Tucannon phase component at 45WT41 (Leonhardy 1970). This shell date was also used by Leonhardy and Rice (1970) as a lower limiting date for their Tucannon phase. Kennedy (1976) reports that the date is now considered invalid as the floodplain sediments housing the shell and Tucannon phase component were later dated to approximately 4,000 B.P.

A radiocarbon date of 4,060±130 B.P. (WSU-1438) was reported stratigraphically above the floor of House 5 at 45AS82 which contained a mixed assemblage of Cascade and Tucannon phase artifacts (Brauner 1976). This date serves only as an upper limiting date for the assemblage. Brauner (1976:152) noted that House 5 was abandoned and that a period of time elapsed whereby the house was "partially, if not totally, filled with sand before the wood charcoal" that was radiocarbon dated, was deposited. The date for this assemblage is important in understanding the timing of the Cascade/Tucannon phase transition. The *in situ* assemblage not only contains early Tucannon phase artifacts, but also shows that the transition occurred before 4,060 B.P.

Ten semisubterranean houses at 10NP143 were dated between 5,050 B.P. to 3,100 B.P. (Ames et al. 1981).

Floor 1 of House 6 was dated at 5,050±320 (Tx3933) (Ames et al. 1981:64). Diagnostic tools on the floor consisted of one Cold Springs side-notched point and two "Hatwai-eared" points. A hopper mortar base was also present (Ken Ames, personal communication 1994). Only a portion of the floor was sampled, but artifacts present indicate that it is a Tucannon phase assemblage. House 6 contains the earliest dated Tucannon phase assemblage in the greater Lower Snake River Region.

Three radiocarbon dates from the floor of House 3 at 45WT134 returned dates of 3,940±80 B.P. (Tx6404), 4,170±70 B.P. (Tx6403) and 4,200±70 B.P. (Tx6402) (Brauner et al. 1990:79). The tool assemblage from the floor was assigned to the Tucannon phase. The floor of House 2 at 45WT134 had three radiocarbon dates of 3,640±60 B.P. (UGa5731), 3,740±140 B.P. (UGa5729) and 3,980±50 B.P. (Tx5828) (Chance et al. 1989, Brauner et al. 1990). The tool assemblage from House 2 was also assignable to the Tucannon phase.

Thus a radiocarbon summary for the Tucannon phase shows that the initial shell date of 5,145 B.P. used by Leonhardy and Rice (1970) as a lower limiting date for the Tucannon phase was later found to be in error (Kennedy 1976). It was not until Brauner (1976) provided an upper limiting date of 4,060 B.P. for the inception of the Tucannon phase at Alpowa, that its lower temporal boundary could be qualified. Kennedy (1976) in his review of the Tucannon phase, reported that the general time period for the inception of the Tucannon phase was approximately 4,000 B.P. to 4,500 B.P. However, the 5,050 B.P. date from Hatwai indicates that the Cascade/Tucannon phase transition had occurred by that time on the lower Clearwater River, and probably along the lower Snake River as well.

A review of the setting and timing of the Cascade/Tucannon phase transition has been presented. Attention now turns to the mechanism responsible for that transition.

Systemic Decay in the Altithermal

The Tucannon phase along the Lower Snake River Region had begun by 5,000 B.P., but what mechanism was responsible for its inception and precipitated 2,500 years of relative cultural stability to conclude? As little or no data exists to support anthropogenic causes for this transition, investigation of the natural environment seems in order. By merging the environmental/climatic data from the previous chapter with the above review of late Cascade phase culture, a plausible explanation may be apparent.

The temporal window for an environmental causation for the inception of the Tucannon phase must exist well after 7,000 B.P. and sometime before approximately 5,000

B.P. These two dates are associated with the basal date for late Cascade phase components and the first radiometric evidence for the existence of the Tucannon phase, respectively.

A review of climatic conditions for this period of time across the southern Plateau and northern Great Basin indicate a general period of increased effective wetness occurred approximately 5,500 radiocarbon years ago.

Mehringer (1986) reports a period of increased effective moisture between 5,000 to 6,000 years ago for the Great Basin, while B. Robert Butler (1978) has proposed a period of cooler, wetter conditions for the northern portion of the Great Basin during the same time period. Mehringer and Wigand (1986) note an increase in grass pollen and juniper as well as a decrease in sagebrush pollen starting at approximately 5,400 B.P. for the northern Great Basin. Wigand (1987) in Reid et al. (1989) reports an increase in pine pollen and a decrease in greasewood pollen starting at approximately 5,400 B.P. for the northern Great Basin as well. Within the Lower Snake River Region, rockfall and temporal data reported in Thompson (1985) and interpolated in this study show an apparent increase in roof spalling at Seed Cave at about 5,250 B.P. Kennedy's (1976) adjustment to Hansen's (1947) palynological data from the Channeled Scabland region of eastern Washington indicate that grass pollen was most abundant during the mid-post glacial at approximately 5,300 B.P. Elsewhere, Denton and Karlan (1973) and Miller (1969) in Schalk and Cleveland (1983) have reported glacial ice advances for the Northwest between 4,900 B.P. and 5,800 B.P., while Butler (1978) has reported a period of glaciation for the northern Rocky Mountains between 5,300 B.P. 4,000 B.P.

The above data indicate that starting just after 5,500 B.P., a cooler and wetter period for the area probably prevailed. The extent of this slightly wetter, cooler period within the Lower Snake River Region can be seen by the occurrence of erosional episodes within tributary streams of the lower Snake River as well as archaeological sites located along the lower Snake River itself.

Cochran and Leonhardy (1981) have documented an erosional episode at the La Grande Sites (35UN52, 35UN74 and 35UN95) within the Blue Mountains at approximately 5,700 B.P. Marshall's (1971) terrace II along the lower Palouse River was also constructed at approximately 5,700 B.P. Kennedy (1976) reports an erosional episode occurred at the Henley Site (45WT114) located up Alkalai Flat Creek at approximately 5,250 B.P. Erosional episodes at 45WT41 (Leonhardy 1970) and 45CO1 (Nelson 1966) along the lower Snake River have been noted, occurring after Mazama tephra deposition and before the heretofore reported time period of 4,000 B.P. to 4,500 B.P. for the inception of the Tucannon phase (cf. Kennedy 1976). Ames et al. (1981) also report five alluvial cycles occurred along the lower Clearwater River between 6,250 B.P. and 5,000 B.P.

The resulting effects of the above events would have had serious consequences to aquatic resources located along the lower Snake River, as well as to people whose economic structure was dependent upon these resources. David Brauner (1976:307) has succinctly reported the probable effects of this scenario:

> The greatest impact would have been on aquatic resources, primarily the salmon. Streams were rapidly downcutting and, as a result, saturated with silt and volcanic ash. Long term erosion would have destroyed many spawning beds while siltation destroyed even more. Volcanic ash eroding out of the side canyons, suspended in the river systems, undoubtedly destroyed countless indigenous and migratory fish. This combination of factors may well have decimated fish populations beyond the point of practical exploitation by man.

That Mazama tephra would have continued to enter stream channels after primary air-fall may be supported by evidence from Wildcat Lake in the Channeled Scablands of eastern Washington. Eric Blinman (1978) has shown that Mazama tephra continued to be redeposited in the lake for 1,300 years following primary air-fall, and subsequently contributed significantly to the lake's sedimentary record during that time period.

It was noted above that Cascade folk were highly dependent on the aquatic resources of the lower Snake River. It was also stated that the abundance of salmonid species may well have been reduced at the close of the Cascade phase time period due to reduced habitat associated with the xeric conditions of the Altithermal as well as the effects of Mazama tephra-fall itself. The results of these events along with a possible decline in elk and deer populations reported within the Snake River canyon during the Altithermal, appear to have put notable stress upon Cascade phase cultural systems. Although homeostatic mechanisms within those affected systems appear to have returned systemic stability, there may not have been enough elasticity within those same systems to endure a series of climatic events that further disrupted the availability of aquatic resources 5,500 years ago. The result of this scenario was system collapse.

This idea has been similarly presented by Brauner (1975, 1976). He too hypothesized a destruction of aquatic habitats along the lower Snake River as the mechanism for the inception of the Tucannon phase. However, his model called for the above events to have occurred at approximately 4,000 B.P., and coincide with the rather abrupt beginning of the Medithermal climatic episode. The model presented herein differs slightly and utilizes the largely unrecognized erosional episodes at approximately 5,500 B.P. within the greater Lower Snake River Region as the mechanism for the inception of the Tucannon phase. Brauner's (1975, 1976) original hypothesis concerning aquatic habitat destruction associated with the erosional episode at 4,000 B.P., seems intact. However, there is no reason to assume that his scenario did not occur at the first significant erosional episode following the apparent period of reduced aquatic habitat postdating 7,000 B.P. The specific mechanism for the inception of the Tucannon phase is believed here to be the climatic events associated with the construction of Marshall's (1971) terrace II at the mouth of the Palouse River, and comparable disconformaties noted at archaeological sites within the Lower Snake River Region.

The significance of the event was not its resulting grand scale of erosional amplitude, in fact Marshall (1971) notes that based on particle size analysis of terrace gravel, the erosional episode responsible for the construction of terrace II was the slightest such event recorded within the lower Palouse River during the Holocene. Rather, the importance of the event may be seen in that Cascade culture was not wholly successful in adapting itself to the entirety of the Altithermal climactic episode, as reported by Bense (1972). No one element of the Altithermal was responsible for the demise of Cascade cultural systems. In fact, it was a combination of several environmental factors that together acted upon a culture which through a series of adaptive modifications (specific evolution) had become too specialized in its routine to adequately absorb stress affecting its core institutions (cf. Sahlins and Service 1960).

> The point of diminishing returns, then, is when the latent dysfunctions of growth and evolution begin to offset the manifest function of improvement. If this point is passed, the system is in danger, for a simpler rival of the same functional potential but with lesser latent dysfunctions may appear. (Turney-High 1968:62).

An evaluation of the setting, timing and mechanism for the inception of the Tucannon phase has been presented. Concluding remarks concerning what became of Cascade people and their cultural institutions are presented below.

VI CONCLUSIONS

Settlement Model

Ken Ames and Alan Marshall (1981:35) have noted that the settlement pattern of the ethnographic Nez Perce "were accommodated to the spatio-temporal patterns of resource availability." It was noted above that a major component of the Cascade phase economy involved the exploitation of salmonids. In keeping, Cascade phase sites are commonly associated with riverine environments of the lower Snake River. Tucannon sites, in comparison, are relatively rare along the same stretches of river. If salmonid abundance had decreased to the point that they were no longer a dependable resource, then what resources did Tucannon folk utilize? Where did Tucannon people go? A review of their tool kit may provide an answer.

The Tucannon phase is characterized, in part, by smaller, crudely made projectile points, numerous scraper tools, hopper mortar bases, pestle-like implements and anvil stones. The tool kit generally reflects activities associated with hunting and processing upland game and vegetable foods. However, Ames et al. (1990) have suggested that hunting was a rather unimportant activity during the Tucannon phase. Large amounts of deer remains at 10NP143 are interpreted by Ken Ames as possibly reflecting a de-emphasis on hunting. What time was spent hunting was opportunistic and used to take only the easily found and dispatched fauna such as deer in the nearby Hatway and Potlach Creek canyons. Ames believes this may also explain that lack of workmanship in Tucannon phase projectile points (Ames et al. 1990). However, evidence reported by Brauner (1975, 1976) would appear to contradict this idea.

Based upon tool assemblages from house floors, the processing of vegetable products appears to have been a dominant activity during the Tucannon phase (Ames and Marshall 1981). Tucannon phase house floors are dominated by excessive amounts of fire-cracked rock as well as hopper mortar bases and pestles (Brauner 1976, Ames et al. 1981 and Brauner et al. 1990). Hide scraping activities also appear to have been a dominant household activity. The economy of the Tucannon phase thus appears to have been largely oriented to the procurement of resources found within the uplands, outside of the Snake River canyon. Although this economic model may account for the lack of Tucannon phase sites reported from within the Lower Snake River Region, other mechanisms have been proposed to account for their absence.

Hallett Hammatt (1976) has suggested that erosional episodes associated with the Medithermal climatic episode were responsible for removing Tucannon phase sites from stream-side terraces. However, he did not explain why such episodes did not remove Windust and Cascade phase sites as well. He also proposed that archaeological investigations have not documented Tucannon phase sites because of inadequate sampling of the numerous gravel bars along the lower Snake River. Brauner (1976) has responded by pointing out most gravel bars within the river canyon have been utilized for dam constructing activity and would have produced Tucannon sites if any were there. Brauner also reports (1976:308) that private artifact collections from the lower Snake River, resulting from widely scattered digging, also show a lack of Tucannon phase material. Ames and Marshall (1981:44) agree with Brauner's reasoning and believe that the absence of Tucannon phase sites within the Lower Snake River Region is a real phenomena. However, they feel that the paucity of Tucannon phase sites reflect the fact that Tucannon people never left the river canyon, but simply merged themselves into large groups thus leaving fewer indications of their presence. Although a provocative idea, the size of Tucannon phase sites as a group along the lower Snake River do not appear to be meaningfully larger than Cascade phase sites.

The location of Tucannon phase sites within the Lower Snake River Region tend to support the argument for an upland subsistence strategy. Based on current archaeological evidence, the entire western portion of the

Snake River canyon appears to have been virtually abandoned during the Tucannon phase. Besides the rockshelter at 45FR50, open-sites 45CO1 and 45WT134 are the western most sites within the Snake River canyon having Tucannon phase components. These two sites are both located at the mouth of the Tucannon River. The Tucannon River is also the stream furthest west within the Lower Snake River Region that has its headwater source in the upland periphery of the northern Blue Mountains. Access to upland and/or montane habitats may have played a determining role in where Tucannon folk chose to locate themselves along the lower Snake River corridor. Indeed, Schwede (1966:14) notes that the availability of food largely determined the location of settlements for the ethnographic Nez Perce. Other Tucannon phase sites along the lower Snake River are all located east of the Tucannon River locale, with the two largest sites (45AS82 and 10NP143) strategically located along the river at locations affording close access to the uplands. The location of these two larger sites prompted Ames and Marshall (1981:44) to state that a major population movement to the Lewiston Basin occurred during the Tucannon phase time period.

Although available data does suggest people largely vacated the lower Snake River canyon for the uplands during the Tucannon phase, evidence for upland sites during this time period is lacking due to little or no investigation of these areas, or the lack of synthesized data from these investigations. Cultural resource surveys on federal land located along the northern periphery of the Blue Mountains have not been synthesized for time sensitive markers. However, Cleveland et al. (1975) in Brauner (1976) have reported Tucannon-like material from the middle Touchet River drainage. Also, in citing a personal communication with Greg Cleveland, Brauner (1976:308) also reports the occurrence of Tucannon-like material from other upland areas to the south of the lower Snake River.

Ken Ames and Allen Marshall (1981:34) have reported that an important criteria for ethnographic Nez Perce winter settlement location was proximity to spring root grounds. "Prior to the horse, local availability of early spring plant resources was the critical variable controlling winter settlement locations and local, winter population densities" (Ames and Marshall 1981:41). Because Tucannon folk were not largely dependent on a riverine subsistence there was no economically necessary reason to locate themselves along the banks of the lower Snake River. However, exceptions to this rule undoubtedly occurred. If a large gravel bar supported numerous spring root plants, or provided close access to productive spring root grounds, and was located adjacent to a fishery that remained semi-productive, then it was probably chosen for occupation over other bars that did not possess such qualities or sites within nearby side canyons void of salmon runs. Sites at the mouth of the Tucannon River (45CO1 and 45WT134) as well as the Alpowa Locality and at Hatwai may fit this prescription.

Spring root grounds were largely located on the plateaus above the lower Snake River (Ames and Marshall 1981). Following the ethnographic model, the lower Snake River tributary drainages accessing these plateaus would likely have served as suitable places for winter encampment. These same tributary drainages would also have supported fauna commonly exploited by Tucannon folk. Unfortunately, the tributary drainages of the lower Snake River have not been intensively investigated by archaeologists. However, when the available archaeological evidence is considered in conjunction with this ethnographic settlement model, the likelihood of the "missing" Tucannon phase sites being located within these archaeologically unexplored tributary drainages seems reasonable.

Semisedentism

Besides a shift in economic emphasis and settlement patterns, the Tucannon phase also marks the appearance of semisubterranean house residences within the Lower Snake

River Region. The appearance of these houses as well as others on the Columbia Plateau during this time period have prompted discussion about what their presence may indicate concerning Plateau demographics and subsistence strategies (Ames and Marshall 1981, Jaehnig and Lohse 1984, Lohse and Sammons-Lohse 1986 and Chatters 1989).

Following the collapse of a riverine oriented economy at the end of the Cascade phase, Tucannon folk de-emphasized riverine resources and aligned themselves with an upland subsistence strategy built largely around the collection of vegetable resources such as kouse and camas (Ames and Marshall 1981, Brauner 1976) and hunting upland game (Brauner 1975, 1976). Although vegetable resources such as kouse and camas are predictable in time and space their abundance is seasonal (Ames and Marshall 1981). If a large portion of the economic structure of the Tucannon phase was built around seasonally available vegetable resources, then there would have been a requisite need for storage of the same resource for use during the winter months. Additionally, a technology that allowed for storage would also have been required.

The appearance of semisubterranean houses during the Tucannon phase need not be thought of as reflecting rapid demographic change related to population increase (Lohse and Sammons-Lohse 1986) or population aggregates (Ames and

Marshall 1981). Their presence may simply reflect three concepts:

1) The Tucannon phase economy was based in part around a resource that, though predictable, was restricted in time and space.

2) The restricted nature of the resource necessitated storage of that resource for off-season consumption.

3) A stored food source largely precluded the need for a pan-mobile winter foraging routine, thus permitting winter sedentism and the construction of sedentary winter residences by small economic groups.

It is important to note that semisedentary residences were the result of an economy based largely upon a dependance on stored root crops, not the reason for root crop dependence.

Because the Tucannon phase economy was not based upon a highly mobile foraging strategy, the energy expended to construct and maintain semisubterranean houses could be afforded and subsequently returned by the advantages the house provided over an extended occupancy period. Semisubterranean houses, then, were a simple byproduct of a semisedentary existence afforded by an economy adopted out of necessity at the end of the Cascade phase.

Existence of semisubterranean dwellings within the Cascade phase time period have not been established with certainty within the Lower Snake River Region or adjacent areas of the Columbia Plateau. Joel Shiner (1961) has reported the possible remains of semisubterranean houses at Hat Creek (35UM5) located on the Columbia River seven miles east of Umatilla, Oregon. These purported house structures were associated with a late Cascade phase component at the site. However, the <u>documented</u> existence of semisubterranean houses has not been confirmed for the Cascade phase time period within the Lower Snake River Region. Similarly, there is also no reason to believe that Cascade folk would have necessarily chosen to excavate house structures given their economic subsistence strategy. Cascade folk were oriented to a riverine environment utilizing a mobile foraging strategy (Bense 1972) with salmonid exploitation probably being an important part of that strategy (Galm 1975). Sedentism during the Cascade phase time period would likely have demonstrated a thorough specialization in salmon exploitation and a storage capability of that resource. Archaeological evidence suggests this was not the case. Further, Randall Schalk (1977) has shown that the level of effort and social contribution required to specialize in the storage of salmon precludes mobile foragers composed of small economic units from doing so. This is not to say that salmon were not an important economic resource to Cascade folk. They most likely utilized the resource as it was available in quantities reflecting point in time needs. Historically, the lower Snake River supported spring, summer and fall runs of salmonid species (Fulton 1968, O.D.F.W. and W.D.F. 1993). If similar runs were present during the Cascade phase time period, the river would have provided seasonal salmonid abundance that was probably supplemented between runs and during the winter by a continued mobile foraging strategy.

The inferred storage of vegetable resources proposed for the Tucannon phase need not reflect increased social differentiation, specialization in task performance, decreased flexibility of group structure or centralization of group leadership proposed by Schalk (1977:240) for the social specialization associated with storing salmon. The nature of storing large quantities of salmon are far different than storing abundant quantities of vegetable resources. Ames and Marshall (1981:44) have noted that although restricted in time and space, vegetable resources are available over an extended period of time at predictable locations. Small economic groups could exploit root fields without regard to the operational confines imposed on economic groups exploiting short term, episodic fish runs. Spoilage concerns are also not a problem for root crops harvested in abundance. Unlike salmon, the processing of vegetable resources may be carried out during the months following harvesting (Schalk 1977). Because large scale efforts requiring the combined efforts of multiple economic units are not required for root crop harvesting and processing, redistribution and control over the final processed resource can be accomplished with relatively minimal social organization (Schalk 1977, Ames and Marshall 1981).

Although Ames and Marshall (1981:46) do not see the small clustering of semisubterranean houses during the Tucannon phase as indicative of the ethnographic pattern or long term sedentary behavior, they do see it as a part of their *Western Village Pattern* that is marked by occasional winter population aggregates (villages) made possible by mechanisms relating to human population size acting in concert with an appropriate habitat structure (Ames and Marshall 1981:38). However, the classification of one or two repeatedly used house structures as a winter village is not in keeping with a village concept denoting an aggregate of spatially distinct economic units.

Three Tucannon phase sites (45AS82, 10NP143 and 45WT134) possess documented semisubterranean house structures. Limiting dates from 45AS82 preclude statements concerning the contemporaneity of its three known Tucannon age house structures. The two documented houses at 45WT134 may be contemporaneous and simply reflect the residences of a small economically functioning group. Ten semisubterranean houses spanning an approximate 2,000 year time span have been reported from 10NP143 (Ames et al. 1981). Ames and Marshall (1981) have used this site as the signature of their *Western Village Pattern*. Although the site was occupied extensively during the Tucannon phase time period, the contemporaneity of house features are not entirely clear (Table 2). Ames et al. (1990:510) feel that the early period of house construction (4,500 B.P. to 4,100 B.P.) at the site may have resulted in the construction of one house every 25 years with subsequent occupation of the site by two or three family groups. Although they do not feel these data are indicative of a village structure, they surmise that previous houses may have also been occupied during each house building episode, thus masking the actual intensity of occupation. However, it may be that the site was simply utilized on a recurrent basis by small individual economic units choosing to excavate new house depressions rather than re-excavate older depressions that had collapsed and/or had partially filled (Ames et al. 1990). Contributing to the interest of the site, Ames and Marshall (1981:42) have speculated that 20 to 30 houses possibly dating to the Tucannon time period remain unexcavated at the site. Although they do not provide supporting evidence for the temporal assignment of these remaining houses, the Hatwai III component assignable to the Tucannon phase was by far the more extensive component at the site. Until additional data is available concerning the excavated houses or remaining houses, the classification of the Hatwai site as a village during the Tucannon phase remains unclear.

HOUSE #	NUMBER OF FLOORS	TEMPORAL ASSIGNMENT
6	Eight	5,050±340 B.P. (Floor 1)
5	Two(+)	5,050 B.P. to 3,400 B.P.
1	One	4,340±90 B.P. (Floor) 3,330±70 B.P. (Fill) 3,130±90 B.P. (Fill)
2	Two	4,120±110 B.P. (Floor 1)
3	Two	4,300 B.P. to 3,400 B.P.
7	Two(+)	4,300 B.P. to 3,000 B.P.
2	Two	3,440±100 B.P. (Floor 2) 3,420±380 B.P. (Floor 2)
4	One	3,240±90 (Floor)
8	One	3,400 B.P. to 3,000 B.P.
9	One	3,400 B.P. to 3,000 B.P.
10	One	3,400 B.P. to 3,000 B.P.

Table 2. Dates associated with each Tucannon phase house at 10NP143. Modified from Ames et al. (1981:133).

Weapon Systems

Three distinct projectile point forms are known from the Tucannon phase (Fig. 7). Leonhardy and Rice (1970:11) have described two of the forms by noting one form:

> has a short blade, shoulders of varying prominence, and a contracting stem. The second variety is notched low on the side or at the corner to produce an expanding stem and short barbs. These seem to be crude versions of forms which, in later phases, are called "Snake River Corner-Notched."

A third point consisting of a "small to medium-sized, side-notched, concave base" (Brauner 1976:295) form was first documented in large numbers at the Alpowa Locality (Brauner 1976, form 01-02A) and later at Hatwai where it was referred to as the "Hatwai-Eared" point (Ames et al 1981:69). The Hatwai-eared points were previously known from Tucannon assemblages, but only as a minor point form (Brauner 1976).

Brauner (1976) has suggested that the (01-02A) or Hatwai-eared point form may be a Lower Snake River Region version of the Elko-eared point of the Great Basin. Upland oriented Tucannon folk penetrating into the Blue Mountains were thought to have borrowed weapon systems and hunting strategies from the Great Basin people they encountered there. Great Basin people having previously adapted themselves to the uplands during the Altithermal would have developed congruous hunting methods for the upland environment. The idea of these strategies and associated weapon systems were borrowed by Tucannon people, but employed their own in-house technology to produce them. The resulting small projectile point forms were crude, thick varieties resulting from the utilization of the retained Cascade phase Levallois-like reduction strategy (Brauner 1976:310-311). Ames et al. (1990) believe that the poor workmanship exhibited in Tucannon phase points simply reflects little effort having been expended in their manufacture due to decreased emphasis on hunting. However, available faunal evidence for the Lower Snake River Region does not appear to support this statement.

Varied projectile point forms and hafting structures indicate that experimentation with weapon systems was probably occurring during the Tucannon phase. Brauner (1976:311) has said "Experimentation by local artisans resulted in a proliferation of small projectile point forms. Reducing the size of the projectile point and experimenting with hafting techniques seem to have occupied the artisan's attention." Indeed, hafting techniques appear to have been in development during the Tucannon phase. One noticeable attribute of most Tucannon phase projectile points are their wide-open side/corner notches, or elongated stems. These haft designs seemingly reflect a need by Tucannon folk to increase the available vertical haft exposure of their projectile point's bases. The results of such a modification would logically increase the vertical stabilization potential of a hafted point. The need for increased vertical stabilization would result if horizontal stability was reduced due to shaft diameter reduction. Evidence for a small shaft design may be indicated by the Hatwai-eared points. The deep concavity resulting from the "eared" design of the points would have necessitated a small shaft to fit in the resulting "pocket." Although a larger shaft with a contoured tip could have been produced to match the entirety of the "eared" point's concave base, other evidence suggests that shaft size reduction during the Tucannon phase probably occurred.

Nelson (1966) has reported neck width and stem width data for the late Cascade and Tucannon phase components at 45CO1. His data indicate that Tucannon folk at the site reduced their contracting stemmed point and expanding stemmed point's stem widths by approximately 21%, and neck widths by approximately 7% from widths associated with the Cold Springs side-notched point of the late Cascade phase. The reduction of stem widths by 21% may indeed reflect intentional design by Tucannon artisans. However, the corresponding reduction of neck widths by only 7% may reflect an obstacle imposed by the points themselves. Nelson (1966) shows that there was virtually no reduction in the overall thickness of projectile points during the Tucannon phase from those at the site during the Cascade phase. However, the overall size of projectile points during the Tucannon phase are conspicuously smaller (Brauner 1976). The slight reduction in neck widths noted at 45CO1 for the Tucannon phase may simply reflect the limit that, in general, Tucannon phase artisans were functionally capable of laterally incising the new, smaller projectile points given their relatively high thickness to width ratio. Indeed, the side-notches on Hatwai-eared points are noticeably shallow and wide. If a relatively thick projectile point is mounted atop a smaller shaft, the need for additional support would logically come from the vertical haft exposure, or side-notches. If the imposed shallow depth of these side notches were not adequate to sufficiently stabilize the hafted point, then wider side notches or elongated stems would probably have sufficed as a hafting compensation. Indeed, Tucannon phase projectile points tend to fit this prescription. Thus it appears that at least one portion of a Tucannon phase weapon system was centered around smaller projectile point forms mounted atop smaller shafts. Ames et al. (1990:512) feel that although the smaller Tucannon phase projectile points are probably not arrow-points, they do reflect a change in "hunting gear" probably indicative of a lighter weapon system.

The need for a modified weapon system during the Tucannon phase was probably a result of intensified upland hunting proposed for the phase by Brauner (1975, 1976). De-emphasis on riverine resources, such as salmon, occurred as their abundance declined to a point that routine exploitation was not an option. A logical substitute for protein in the Tucannon diet would have been increased reliance upon terrestrial fauna. Because of decreased deer and elk numbers during the latter part of the Altithermal (Gustafson 1972), and/or a requirement to take more upland game per unit of effort to replace lost salmon protein, Tucannon folk probably adopted new hunting strategies and weapon systems to go along with their new subsistence strategy focused on the exploitation of the uplands.

David Brauner (1975) has also proposed that the profuse amounts of river mussel remains found within Tucannon phase sites reflect its use as a protein dietary adjunct resulting from the decrease in availability of salmon.

Internal Consistency of the Tucannon Phase

A nagging problem confining discussions of the Tucannon phase are the results of Kennedy's (1976) internal consistency test of the phase. Using stylistic, utilization and descriptive classifications for Tucannon phase artifacts from 45CO1, 45WT39B and 45WT41, Kennedy determined that the phase was not internally consistent. Specifically, Kennedy (1976) determined that the six Tucannon phase assemblages used in the test were not representative of the same stylistic tradition. Instead, two distinct cultural groups were thought to have occupied the Lower Snake River Region during the Tucannon phase.

The six assemblages used in Kennedy's test were temporally ordered based upon their inferred relative stratigraphic position and are listed below.

Time ↑	Assemblage	Site
	B2 A B3	(45WT41)
	39B	(45WT39B)
	3B/C 3A	(45CO1)

Kennedy (1976) attempted a seriation using thirteen different projectile point forms to confirm the assemblages' stratigraphic ordering. The resulting pattern did not sufficiently match "the unimodal curve required for an unambiguous frequency seriation" (Kennedy 1976:141). Although further statistical analysis did confirm the ordering of intra-site assemblages it could not confirm the overall ordering of assemblages from the three different sites. The statistical analysis of projectile point forms further showed that there was another factor controlling the aberrant seriation results other than time (Kennedy 1976:146). Indeed, the utilization and descriptive tests also produced two clusters indicating two distinct cultural influences. Assemblages from 45CO1 and 45WT39B were shown to be from the same stylistic tradition while assemblages from 45WT41 were, in each case, shown to be from a second stylistic tradition. Because the statistical analysis showed other factors controlling the bimodal results other than time, and the seriation tests could not confirm the initial ordering of assemblages based on their inferred stratigraphic ordering, Kennedy (1976:154) surmised that the 45CO1 assemblages and basal assemblage B3 at Granite Point were probably contemporaneous based upon the similarities of the 45CO1 assemblages with assemblages from the middle Columbia River that dated to about the same time as the 45WT41 assemblages. Tucannon phase assemblages at 45WT41 were encased within the later floodplain sediments that Kennedy (1976:22) reported dated after 4,000 B.P. However, other evidence may exist to support his original assignment of the 45CO1 assemblages as Tucannon phase progenitors.

Brauner et al. (1990:145) have reported an hypothesized sequence of settlement at the mouth of the Tucannon River during the Holocene. They noted that climatic periods characterized by increased effective moisture coincide with occupation of 45WT134, located high upon an inhospitable Pleistocene gravel bar opposite the mouth of the Tucannon River. Conversely, climatic periods associated with reduced effective moisture coincide with occupation episodes at 45CO1, located lower on the floodplain at the mouth of the Tucannon River. That periodic erosional events occurred at 45CO1 throughout prehistory can be seen in the numerous disconformities reported within the archaeological sequence at the site (Nelson 1966). Thus it appears that flow regimes and flood events largely dictated where people chose to locate themselves at the 45CO1/45WT134 locale. One irregularity noted by Brauner et al. (1990:146) is that 45CO1 and 45WT134 both possess Tucannon phase components. Although this dual occupation seems to contradict their proposed oscillating residence pattern, it does not.

Previously, the inception of the Tucannon phase was thought to roughly coincide with the beginning of the Medithermal climatic period associated with increased effective moisture (Brauner 1976, Kennedy 1976). Flood events during this time period would likely have forced Tucannon folk to move from the preferred setting of 45CO1, across the Snake River to the barren gravel bar of 45WT134. However, 45CO1 contains one of the largest Tucannon phase components reported to date from the Lower Snake River Region.

Evidence reported by Brauner (1975, 1976), Kennedy (1976), Brauner et al. (1990) and within this study show that the Medithermal climatic episode had probably started within the Lower Snake River Region just prior to 4,000 B.P. If the inception of the Tucannon phase is placed at approximately 5,500 B.P., then Tucannon folk would have had slightly less than 1,500 years of occupation at 45CO1 to deposit one of the largest Tucannon phase components reported to date, before moving to 45WT134. Put within this temporal framework, archaeological evidence from the Tucannon phase time period at 45CO1 and 45WT134 appear to support, rather than contradict, the oscillating residence pattern proposed by Brauner et al. (1990).

Although there are no radiocarbon dates to document when 45CO1 was occupied, it seems reasonable to assume that if Tucannon folk had no reason to move from 45CO1 where they had previously resided during the Cascade phase, then continuous occupation up to the time of the Medithermal flood events probably occurred. Thus the reported Tucannon phase occupation at 45CO1 probably dates from approximately 5,500 B.P. to 4,200 B.P. The date of 4,200 B.P. marks the earliest Tucannon phase occupation known from 45WT134. When, or even if, Tucannon folk returned to 45CO1 is not known, but certainly must have occurred well after 3,600 B.P. if at all, based upon an upper limiting date for Tucannon occupation at 45WT134.

Interestingly, Ames et al. (1990:531) citing a personal communication with Hal Kennedy state that the only Tucannon phase component resembling the early Tucannon phase material at Hatwai and Alpowa (pre-4,000 B.P.) is at 45CO1.

Thus the Tucannon phase assemblages at 45CO1 probably predate the reported Tucannon phase assemblages at 45WT41. Kennedy (1976:146) has noted that, in part, for his seriation results to be valid all groups included in such a comparison must be of comparable duration. Although the assemblages from 45CO1 and 45WT41 do not appear to be concurrent, they are certainly both representative of the Tucannon phase as originally proposed by Leonhardy and Rice (1970). Additionally, Kennedy's consistency tests show that the Tucannon phase assemblage from 45WT39B may have actually been contemporary with several of the 45WT41 assemblages, but yet it did not cluster with 45WT41. Instead, the 45WT39B assemblage appears to cluster with the 45CO1 assemblages which it is thought to have temporally descendent from.

The results of Kennedy's (1976) graphic seriation and related statistical test, as well as the descriptive and utilization classification tests, all indicate that the assemblages from 45WT41 differ significantly enough from those of the 45CO1 and 45WT39B to be included within a different stylistic tradition. Although the precise temporal association of the 45WT39B assemblage is not exactly known, the 45CO1 and 45WT41 assemblages can be viewed as a pre- and post-Medithermal Tucannon phase component. That the aberrant 45WT41 Tucannon phase assemblages probably date after the inception of the Medithermal may not be significant in relation to the climatic event itself, but rather the timing of the climatic event. As stated above, the Medithermal climatic period is thought to have began at approximately 4,000 B.P. It has also been shown that the Tucannon phase economy was largely oriented to the exploitation of upland resources.

Stan McDonald (1986) has reported that use of the Dooley Mountain obsidian source south of current day Baker, Oregon between 8,000 B.P. to 5,000 B.P. was not extensive. However, between 5,000 B.P. to 3,400 B.P., use of the obsidian source is well represented and indicates use by Great Basin people, or by people in contact with Great Basin people (McDonald 1976:181).

George Jones (1984) has shown that occupation of the Steens Mountain area in southeastern Oregon by Great Basin folk increased dramatically at 4,000 B.P. and represents the most intense usage of this upland area for any period of time during the Holocene. Not only did the size of sites increase, but so too did the frequency of sites.

From this evidence, it appears that use of the eastern Oregon uplands by Great Basin people increased noticeably starting at approximately 4,000 B.P. Why upland use of these areas during this time period is greater than during the peak of the Altithermal is not known. John Fagan (1973, 1974) has previously reported increased utilization of the uplands of southeastern Oregon for the warmer, dryer period of the mid-post glacial time period, not for 4,000 B.P. Nevertheless, it appears that the likelihood of upland oriented Tucannon folk coming into contact with Great Basin people increases at approximately 4,000 years ago. That the Tucannon phase assemblage from 45WT41, dating to probably just after 4,000 B.P., is representative of a different stylistic tradition than previous Tucannon phase assemblages, might be explained by the influence resulting from upland contact with Great Basin people. This would not, however, explain why the 45WT39B assemblage groups with the 45CO1 assemblages. Based upon his consistency tests, Kennedy (1976) has reported the 45WT39B assemblage may be contemporary with the Tucannon phase occupation at 45WT41. Unfortunately, no evidence for a temporal assignment of the 45WT39B Tucannon assemblage was obtained during the course of excavation (Yent 1976). Given the temporal uncertainty of the 45WT39B Tucannon phase assemblage, influence from the Great Basin must remain a possibility for the different stylistic tradition indicated within the assemblages of 45WT41.

A second possibility that may account for the bimodal clustering of Tucannon phase assemblages was noted by Leonhardy and Rice (1970). They reported internal development during the last 2,000 to 3,000 years has resulted in cultural differences within the Lower Snake River Region. It is possible that such development had its origins during the early Tucannon phase.

The Cascade phase economy was based largely around a mobile foraging strategy. Bense (1972) has also reported the similarity of intra-phase artifacts from Cascade phase assemblages. In comparison, the Tucannon phase economy was less dependent upon mobile strategies. A dependence upon stored root crops would have largely dictated seasonal rounds in addition to supporting a semisedentary existence. A non-village structured semisedentary existence in addition to the repetitive seasonal rounds centered about the exploitation of root crops found in the same place at the same time each year (Ames and Marshall 1981), may have served to sufficiently isolate small economic groups resulting in decreased rates of diffusion. As a result, incipient forms of archaeological districts, each experimenting with a similar weapon system, may have formed during the Tucannon phase as early as 4,000 B.P. Indeed, Kennedy (1976) has noted the presence of thirteen different projectile point types for the phase. If archaeological districts were developing during the phase, one might expect to see Kennedy's (1976) bimodal distribution group 45WT41 and 45WT39B together as they are located only several miles apart. His classification tests did not. Still, the Wawawai Locality may have been an actual cultural boundary within the Lower Snake River Region. Indeed, 45WT41 is the furthest site east within the Region used by Leonhardy and Rice (1970) in developing their cultural typology. It must also be remembered that the Lower Snake River Region was a tactical unit (Kennedy 1976) not based upon recognized cultural boundaries. Actual boundaries within this arbitrary unit undoubtedly exist. An internal consistency test of the Harder phase would likely show internal problems similar to what Kennedy (1976) has reported for the Tucannon phase.

Further subdivision of the Tucannon phase has been proposed by Ames et al. (1990). They have divided Ames' et al. (1981) Hatwai III component into an early Hatwai IIIa component and a later Hatwai IIIb component. The earlier component dates from 5,500 B.P. to 4,100 B.P. The later component dates from 3,400 B.P. to 2,800 B.P. The Hatwai IIIa component is identical to what Leonhardy and Rice (1970) have reported for Tucannon phase tool assemblages with the exception of projectile point forms. A dominant number of the Hatwai-eared projectile points within an otherwise typical Tucannon phase tool assemblage prompted Ames et al. (1990) to incorporate Hatwai IIIa and Brauner's (1976) House 5 tool assemblages into one unit, the *Hatwai complex*. Ames et al. (1990) classify the Hatwai IIIb component as a Tucannon phase component and distinguish it from the previous Hatwai IIIa component by the diversity of its projectile point styles. Although similar to the previous Hatwai IIIa component, the Hatwai IIIb component contains stemmed and corner-notched point forms that are apparently rare in the former component. Ames et al. (1990:512) have reported that like assemblage 82-2 at Alpowa, the Hatwai IIIb component does not contain the "Rabbit Island stemmed" type points that are normally found in Tucannon phase components. Also, Ames et al. (1990:513) report that the Hatwai IIIb component contains cores and net sinkers which do not occur in the earlier component. Additionally, projectile points, bifaces and scrapers appear to be more numerous in the Hatwai IIIb component, however Ames et al. (1990) caution that these data may simply be a result of assemblage size. Indeed, occupation of the site appears to have been greatest between 3,400 B.P. and 3,000 B.P. (Ames et al. 1990:509) and thus inclusive within the proposed Hatwai IIIb component. Mortars, pestles, anvils and cobble tools do not appear to change in frequency between the early and later Hatwai III components.

Although Ames et al. (1990) acknowledge a lack of data, they feel that their Hatwai IIIa component is distinctive enough from Cascade and Tucannon phase components to be assigned a phase of its own. They believe a new phase is needed to include the late assemblages of the late-Cascade phase as well as the *Hatwai complex* material. The previous Cascade phase would then terminate sometime between 5,500 B.P. and 5,000 B.P. The proposed *Hatwai complex* phase would extend from the end of the Cascade phase to approximately 4,000 B.P., signifying the inception of the Tucannon phase. Although this model proposes some intriguing refinements to the culture history of the Lower Snake River Region, more published data is certainly needed before the *Hatwai complex* material can be assigned as a new phase within the Region.

Ames et al. (1990:513) have also proposed a shift in residential strategies for the period between 3,900 B.P. to 3,500 B.P., due to a lack of semisubterranean houses during this time period on the Columbia Plateau. Although their proposal did not have the benefit of data from 45WT134, the location of 45WT134 may support their reasoning. As shown above, Hatiuhpuh is located at a rather unexpected location at the mouth of the Tucannon River. I have also postulated the lack of Tucannon phase sites along the lower Snake River to be a result of a settlement pattern centered largely within the side canyons of the Region. Evidence at Hatiuhpuh appears to indicate that residential settlement patterns were apparently altered as a result of flood events associated with the onset of the Medithermal climatic episode. It seems reasonable to assume that other riverside locations within the southern Plateau may have been similarly affected by flood events during this time period, with corresponding actions by affected residents. It was probably at this time that occupation of the side canyons within the Lower Snake River Region was highest. That residential patterns changed at approximately 4,000 B.P. coupled with the apparent concurrent addition of a second stylistic tradition within the Lower Snake River Region (cf. Kennedy 1976) may indicate internal development within the Region resulting from reduced diffusion between groups. Ames' et al. (1990:531) "regional facies" and Leonhardy and Rice's (1970:2) "districts" may have had their start as a result of the effects of the Medithermal climatic episode on people within the Lower Snake River Region of the southeastern Columbia Plateau.

Regardless of the origin of variability within Tucannon phase assemblages, the Tucannon phase as defined by Leonhardy and Rice (1970) is not a classic stationary state, but rather one exhibiting dynamic intra-regional development.

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